JUNE 26, 1961

American Machinist / Metalworking Manufacturing

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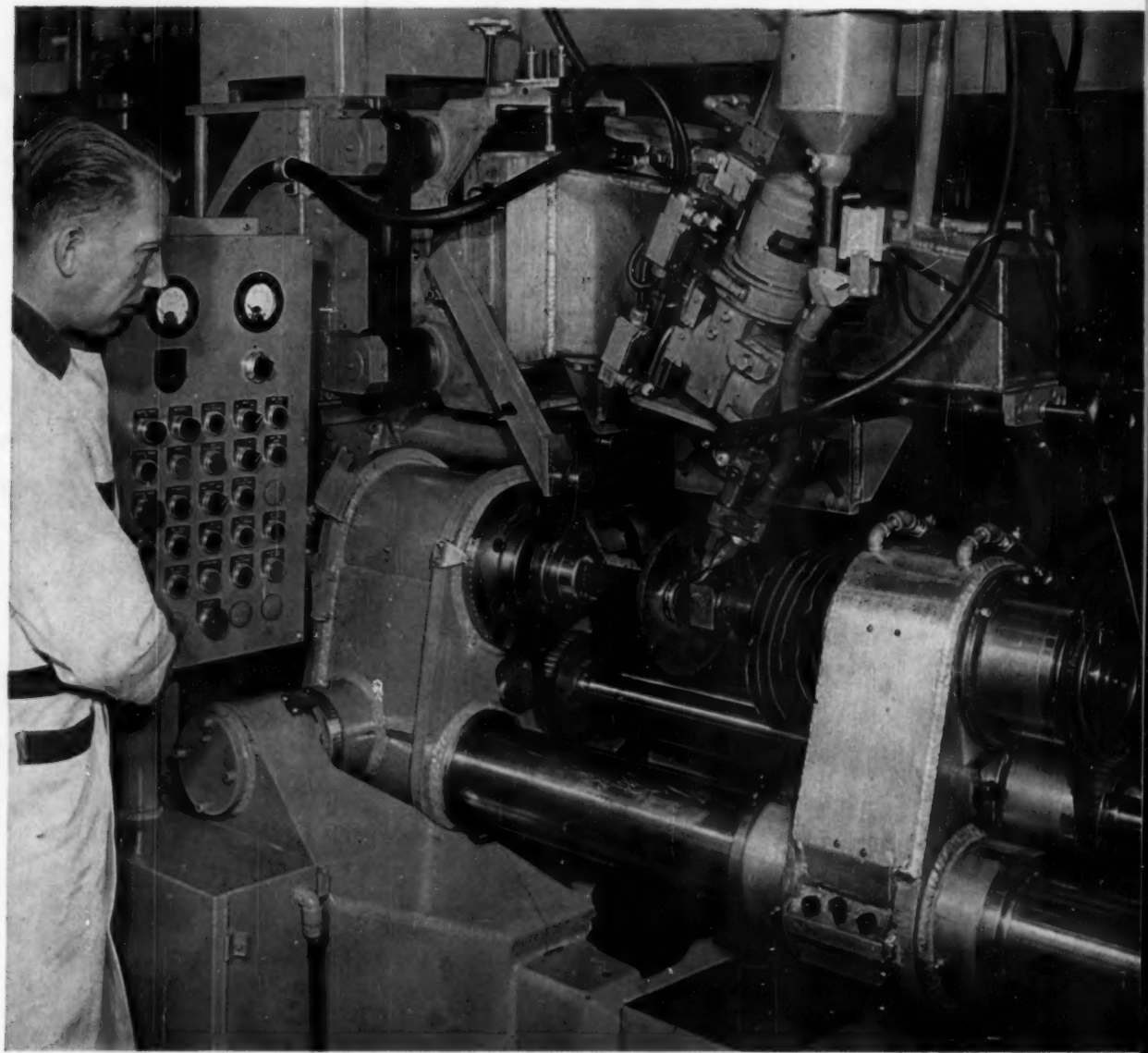
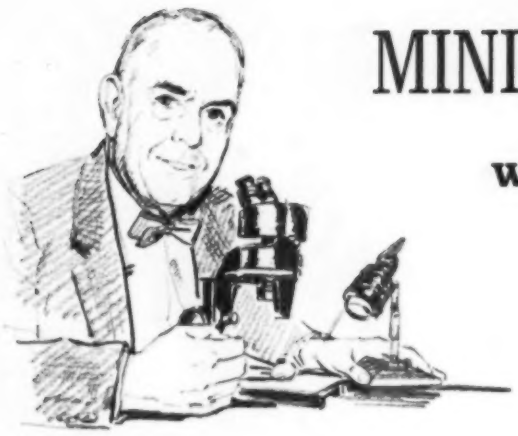


Cam controls welding of irregular contours—see page 74

- **Milling with ceramic tools,** page 67
- **Stripforming on a four-slide,** page 81



MINIATURE GRINDING...

With A New Problem-Solving Internal

by Stuart St. John
Assistant Sales Manager
The Heald Machine Company

Seldom does any new machine represent all the answers to the desires of production people. But the new Model 090A and 0901A miniature internal grinding machines come mighty close. In fact, these new machines constitute a major break-through in the ability to control variables inherent to miniature internal grinding. This, in addition to substantially faster machine cycles, was made possible through a complete analysis of all miniature grinding techniques. Based on the findings of our research and development engineers, this machine was designed, produced and has proved its capabilities most convincingly. Here are some of these developments which have been incorporated in the new design and which have placed these machines well ahead of their time by present-day standards.

NEW models provide simpler, more reliable and infinitely adjustable wheel-wear compensation from 0 to .001 resulting in substantially longer wheel life.

NEW, lighter-weight vibration-damped cross slide on antifriction ways gives concise and consistent repeatability.

SIMPLER, more efficient control and equipment arrangement permits easy service inspection through hinged doors at rear. No access necessary from either end.

NEW models feature a 75% reduction in hydraulic and electrical control equipment, simplified circuitry and ⅓ smaller electrical cabinet.

NEW feeding method gives greatly improved control of size and taper, increases accuracy by as much as 50%.

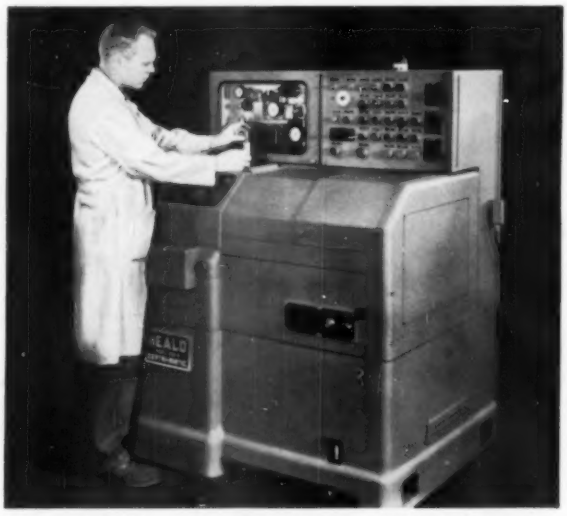
NEW direct-reading micrometer dials permit cross slide to be precisely positioned without use of dial indicators.

NEW cross slide resets automatically for wheel change; at press of button, machine automatically dresses wheel and re-enters cycle with resultant saving of operator time.

NEW direct-reading digital dial shows operator the amount of wheel life remaining at all times.

NEW, simpler, 3-piece guarding retains all coolant yet opens easily to expose complete machine.

These and other improvements make the 090A and 0901A miniature internals that challenge *any other machines* intended for this class of work. Your Heald engineer will be glad to arrange a demonstration for you.



Heald Model 090A precision internal, designed specifically for grinding miniature bores. Smallness of bore is limited only by the availability of small diameter wheels.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

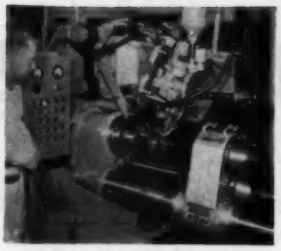
Subsidiary of The Cincinnati Milling Machine Co.

WORCESTER 6, MASSACHUSETTS

CIRCLE 251 READER SERVICE CARD

COVER:

Cam controls contour welding machine developed by Expert Welding Machine for Rockwell Standard. See page 74



American Machinist / Metalworking Manufacturing

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METALWORKING REPORT

. . . what's new and significant in manufacturing techniques and materials—

direct from our own staff and round-the-world news bureaus

CUTTING . . . A 110-word computer "language" greatly simplifies preparation of tapes for N/C milling machines. Called Autopromt (Automatic Programming of Machine Tools), the language describes the surfaces of the 3-D shape to be milled, rather than cutting-tool paths. **A computer, programmed to interpret the language, then generates the tool-path instructions, which are converted to paper tape.** IBM developed the language, in cooperation with United Aircraft. In one job planners, working directly from blueprints, needed only 180 one-line statements in the new language to describe a complex helicopter gearbox cover. For details, see p76.

HEAT TREATING . . . Special salt-bath treatment of HSS tools can boost tool life from 45% to more than 100%. This deep-recycling method, called the Sunite Process, can **raise tool hardness up to two points on the Rockwell scale—to as high as Rh 70C—without causing brittleness.** Developed by Sun Steel Treating Co (Farmington, Mich), the process is applied to green, untreated steels. Applications are in the low carbide range, where HSS normally is not hard enough, but where carbide may be too expensive.

MATERIALS . . . Satisfactory forgings of hot-pressed beryllium metal have been made without the usual steel jackets for support or shielding. The Beryllium Corp and Wyman-Gordon Co have completed 16 trial forgings without using jackets. In a 600-ton hydraulic press at a stroke of 72 ipm, the Berylco HP-20 material was forged at 1400F preheat temperature. Dies were preheated to 800F. Lubricant was a special solid.

WELDING . . . "Enclosed welding" joins reinforcing rods quickly and may work in other applications. The enclosure is a split copper block, clamped around the ends of the 1-in. rod. **With ⅜-in. spacing between ends, the joint takes one minute** and one 14-in. electrode (E7017 or E12016), says W P Campbell of the Dept of Mines and Technical Surveys (Ottawa, Canada). Tensile properties are almost equal to those of unwelded rod—but it's best not to bend at the joint location.

FORMING . . . Forgings in steel and copper have been made on a Dynapak by American Brake Shoe Co (Mahwah, NJ). The firm expects to produce close-tolerance parts from exotic, high-quality materials for missile and other industries. For details, see p72.

INSPECTION . . . Non-uniformity in movements of machinery can be detected by a recently developed Angular Velocity Variation Tester, sold by the Kurt Orban Co. On a gear shaper, for example, the tester is immovably connected to replace the gear blank to be cut. **Thus it shows the forces that normally act on the gear blank.** Within the tester's housing, a suspended, friction-free mass provides a uniform reference movement. Relative motion (distortion) between this mass and the housing during machine operation appears as an electrical signal that can be recorded or read as a numerical measurement.

FORMING . . . Ram movement that can set to repeat within ± 0.0005 in. is claimed for a 30-ton press brake. Pedersen Electronics (Lafayette, Calif) builds the machine with a **pair of electronically controlled hydraulic cylinders** at opposite ends of the ram.

MANUFACTURING CONTROL . . . Research and production have teamed up in a unique program with this goal: **Find ways to make large-scale reductions in the size and weight of electronic components.** At the Arma Div of American Bosch-Arma, a special lab for microminiature work contains tiny versions of standard machine tools. **Research uses production know-how to evaluate existing techniques and adapt them to microminiature work.** First product is a digital computer, with circuit boards the size of postage stamps, that weighs only 15 pounds.

FINISHING . . . A high-speed, rotating spray gun puts a coat of paint on work at speeds as high as 750 rpm. Developer (Finish Engineering Co, Erie, Pa) claims that paint coverage over folds, corners, and other hard-to-coat areas is perfect. **Production rates reportedly are ten times higher than those of conventional techniques.** Spinning over the surface of the work, the gun finishes it in a single pass. In an alternate arrangement, the work may be spun in front of the gun.

INSPECTION . . . A thousand precise measurements in only two hours—that's the capability of a tape-controlled measuring machine just announced by the Sheffield Corp. The system simultaneously measures the inside and outside contour of a part (such as a missile nose cone), determines wall thickness, and prints results. Electronic gaging styli can be positioned at any point or angle to within 1/10,000th of an inch. For further details, see p 77.

MATERIALS . . . First commercial order for titanium-clad steel plate has been accepted by Lukens Steel Co (Coatesville, Pa) from Dupont. For use in a chemical processing reactor, **the clad titanium is 25% cheaper than solid titanium plate.** The 1½-ton order included one plate (204 by 64½ by ⅝ in.) of 22% titanium on A-204 backing steel, plus one 66¼-in.-diameter head pressed from the same material. Lukens is taking orders for titanium-clad on a development basis only.

FINISHING . . . Continuous strip-coating line paints up to 1 million sq ft of steel or aluminum per day at Litho-Strip Corp, Chicago. In one continuous cycle, the line will chemically clean, surface treat, paint, cure, cool, and coil strip material up to 68-in. wide in gages up to 0.064 in. **Coating thickness can be cont rolled to ∓ 0.0001 in.** on either or both sides, which can be similar or different colors or in special printed patterns. **Line, which operates at 150 fpm, has accumulator tower** to allow welding in a new coil without shutting down the line.

Continued on next page

Coming in AM/MM

- ***Jig design for precision furnace brazing***
- ***Getting the bugs out of 3-wire measurement***
- ***Mechanical drive for transfer machines***

METALWORKING REPORT . . .

INSPECTION . . . Errors in gage block calibration arising from wringing-film thickness may be minimized in the future by an optical technique developed by the National Bureau of Standards, Washington 25, DC. Technique, which makes use of the phenomenon of frustrated total reflection of light, permits measurement of the film thickness to a **fraction of a microinch,** has a sensitivity of approximately 20 billionths of an inch.

FINISHING . . . Eliminate hand-buffing of parts prior to plating? That's the claim for a new tumbling chip, Honite Z-N, from Minnesota Mining & Mfg. The new shape is **very light, compared to ordinary tumbling shapes;** this lightness permits a **larger-than-ordinary chip that does tumbling without impinging the work.** After tumbling, parts have a surface finish comparable to hand-buffed parts.

MATERIALS . . . An austenitic-ferritic steel alloy containing chromium, nickel, manganese, and copper has been developed by the Soviet Heavy Engineering Research Institute for water turbines. Used for blades in Francis-type turbines, the alloy designated ICH 18—N3G3D2-L, is welded to the rotor rings. Also, complete wheels cast from the new alloy are being tested. After more than 10,000 hr of operation no repairs to the welded blades have been necessary.

INSPECTION . . . Diamond indenters for checking the hardness of carbide should be frequently checked for dulling, and reground if necessary. Don Oberg of Oberg Mfg Co reports that **five independent sources did not agree on hardness of test samples** of carbide, because of divergencies in hardness testing equipment and procedures.

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CINCINNATI

LOW-COST MACHINING

STARTS HERE ..... *with High-Quality Cutters*

Ground on a Cincinnati

Photo Courtesy of Conical Tool Company, Grand Rapids, Michigan

Accurate 5° taper end mill is quickly ground on a CINCINNATI No. 1 Cutter and Tool Grinder.

Cutters make or break the performance records of cutting type machine tools. Progressive cutter manufacturers like Conical Tool Company, of Grand Rapids, Michigan are interested in seeing them *make* production records. They do this by producing cutters of the highest quality, and giving them a final touch of excellence by grinding the teeth on CINCINNATI Cutter and Tool Grinders. Whether you are manufacturing cutters or re-grinding them for day-to-day production, you can give them maximum cutability and lowest increment of production cost by grinding them on CINCINNATI Machines.

Six Cutter and Tool Grinders . . . No. 1, No. 2, Monoset, Contour, Projecto-Form and Electrolytic . . . are built by Cincinnati to give you the right size and type for your cutters. All are constructed to the highest standards of performance and reliability. For example, table slideways of the Nos. 1 and 2 Machines are antifriction; hardened and ground. Eccentric swivel mounting of wheelhead simplifies the setup chore of adjusting the wheel to the desired angle for grinding. In addition, it provides the effect of extra cross range when needed. Many other feature-advantages are fully described in attractive literature which we will gladly forward to you.

And now, turn the page for a quick appraisal of the entire family of CINCINNATI Cutter and Tool Grinders. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

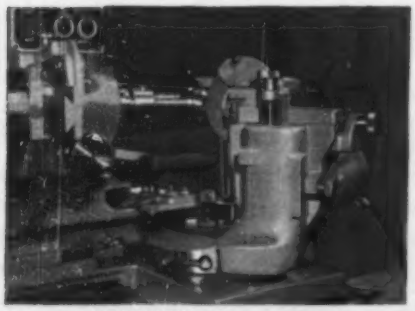
KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES • CUTTER AND TOOL GRINDERS • VERTICAL BROACHING MACHINES • ELECTRICAL MACHINING EQUIPMENT

CINCINNATI

MILLING MACHINE DIVISION

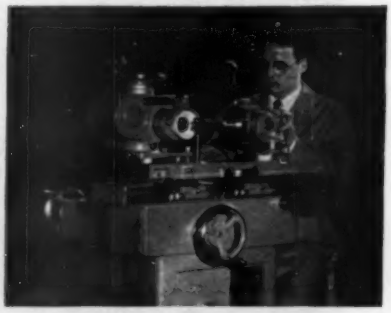
FOR TOP METAL CUTTING EFFICIENCY

CINCINNATI GIVES YOU A CHOICE OF... 6 CUTTER AND TOOL



CONTOUR offers big savings for shops having a volume of form milling operations. It grinds form milling cutters on the periphery of the teeth to a definite cutting clearance chosen for the work material. Contour ground cutters produce a greatly superior finish at a higher feed rate. Catalog No. M-1918-1.

MONOSET sharpens, repairs and makes small cutters, including countersinks, those required for die sinking and other unusual shapes. Because of its universal construction, most jobs can be completed in one chucking. Built-in spiral lead mechanism generates infinitely variable helices, right or left hand, $1\frac{3}{16}$" min. lead. Catalog No. M-1591-4.



NO. 1—Perfect for shops using only small to medium sized cutters (companion machine to the larger No. 2). Timesaving features include anti-friction table slide; eccentric wheelhead swivel mounting; reversible motor built into wheelhead; three-way controls. Capacity: 8" swing over table, 15" between centers. Catalog No. M-1852-4.

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES • CUTTER AND TOOL GRINDERS •

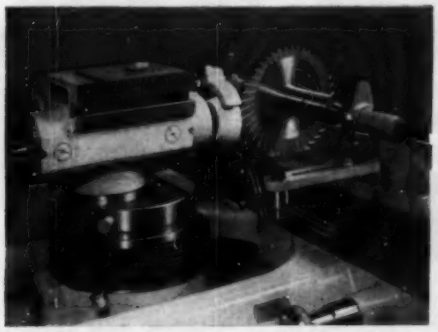
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CIRCLE 255 READER SERVICE CARD

It takes a keen cutting edge to unlock the full potential of cutting type machine tools. And the keenest cutting edges are the product of modern, accurate cutter and tool grinders. Cincinnati gives you a choice of six of the finest. Two of them, the Nos. 1 and 2, are designed for shops using a wide variety of conventional cutters, such as those required for milling, reaming, turning, etc. "Check List of Good Cutter Grinding Practice," publication M-1992, is available to help operators of Nos. 1 and 2 machines do a better job. The Monoset supplements the foregoing machines by taking over all die sinking cutters, unusual shapes, and grinding flutes from solid bar stock. The Contour and Projecto-Form Grinders, as their names indicate, perform specialized types of cutter grinding. Electrolytic Grinders "grind" carbide cutters faster and at a fraction of the wheel cost ordinarily associated with diamond wheel grinding . . . no burrs, no checks or cracks.

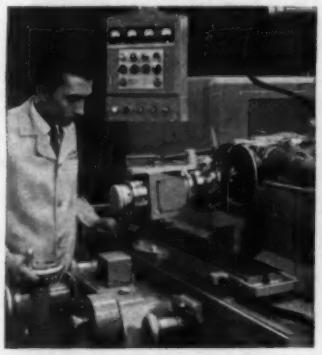
Detailed information may be obtained by writing for literature mentioned in the captions. And for shops requiring cutter grinding equipment built to order, talk to our Engineering Service Specialists.

GRINDERS



NO. 2—Designed to handle the majority of cutters used in metalworking shops . . . milling cutters, reamers, hobs, taps, planer tools. Attachments include Radius Grinding; Face Mill; Indexing for Workhead; Dust Exhaust; Spring Chucks and Collets. Capacity: 10" swing over table, 27" between centers. Catalog No. M-2004.

PROJECTO-FORM—For grinding small, accurate profile shapes on flat form cutters, lamination die parts and similar components. This machine combines grinding with an optical comparator unit. Work profile is enlarged 20 (or 40) times size on ground glass viewing screen directly in front of operator. Master drawings are made on Layout Scribing Machine. Catalog No. M-1612-5.



ELECTROLYTIC "grinds" a wide variety of cutters and tools made of materials too hard for conventional grinding wheels. The surface produced is burr-free and metallurgically undisturbed.

CINCINNATI

VERTICAL BROACHING MACHINES • ELECTRICAL MACHINING EQUIPMENT

CINCINNATI®
MILLING MACHINE DIVISION

CIRCLE 256 READER SERVICE CARD

On these pages you'll find the number of the FELLOWS gear inspection instrument that precisely matches your needs.

In fact, right from the gear blank to the finished external or internal spur or helical gear, FELLOWS has a complete line of gear production *and* inspection equipment.

One of the most important FELLOWS developments is the No. 4 Red Liner for fine-pitch gear inspection. It makes "composite" checks on the finest instrument gears with remarkable accuracy and sensitivity. Magnifications of 1600 to 1 are obtained thru the electrical recording system which provides a written, unbiased record for instant reading or for proof-of-accuracy files. It's the *best* way to check tiny gear components such as that shown actual size at top of right-hand page . . . a 22-tooth, 96 D.P. pinion backed up to an 80-tooth gear on a cluster.

WE'VE GOT YOUR

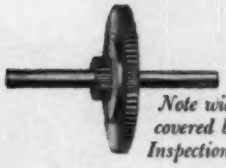
NO. 4 FINE PITCH RED LINER. For composite check of external and internal spur and helical gears. Maximum P.D.–4".

NO. 8 RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. depends on design.

NO. 12M INVOLUTE MEASURING. For external and internal spur and helical gears. Maximum P.D. — 12". No. 24M — 24" cap.

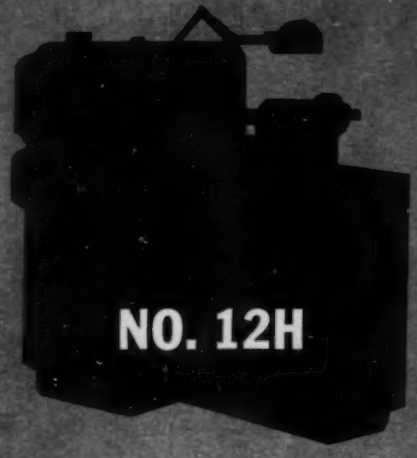
NO. 20M RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. — 18".

Keep *your* production and inspection operations efficient and economical with today's most advanced gear manufacturing equipment. Get complete details on FELLOWS equipment from your nearest FELLOWS branch office.



Note wide range of size covered by Fellows Gear Inspection Equipment.

NUMBER



NO. 12H

NO. 12H LEAD MEASURING. Continuous-originating type lead measuring of external and internal helical gears. Maximum P.D. —12". No. 24H has 24" capacity.

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78 River Street, Springfield, Vermont
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THE PRECISION LINE

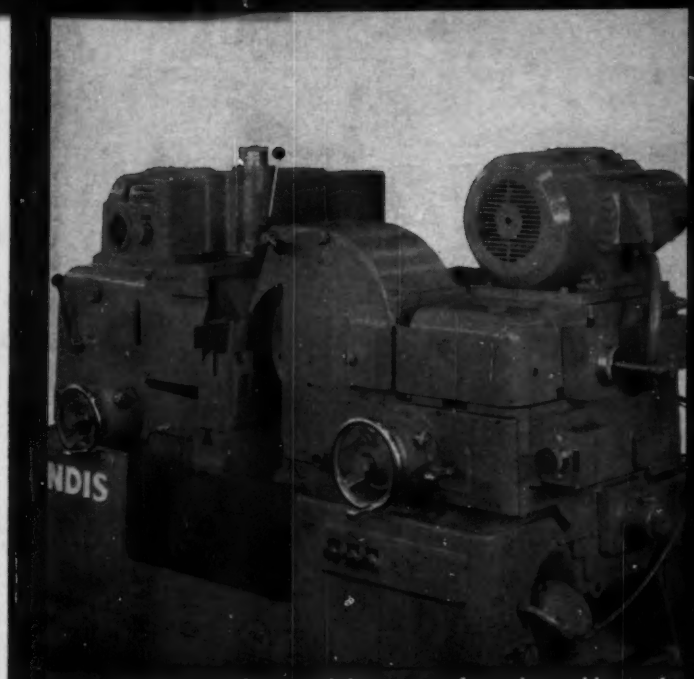
Fellows

Gear Production Equipment

New dressing accuracy . . . Landis Truform dresser with preloaded ball slides, gives exact duplication of the profile on the wheel.

Faster grinding cycles . . . New and exclusive Landis Lockspeed drive for regulating wheel gives quicker sparkout and rounder work.

Four outstanding advantages of



Greater machine stability . . . surface plate ribbing of cast bed maintains perfect alignment of ways for both wheelheads.

Close tolerances . . . work rest solidly mounted on bed with support directly to the base for heavy stock removal without loss of accuracy.

the allNEW Landis centerless grinder

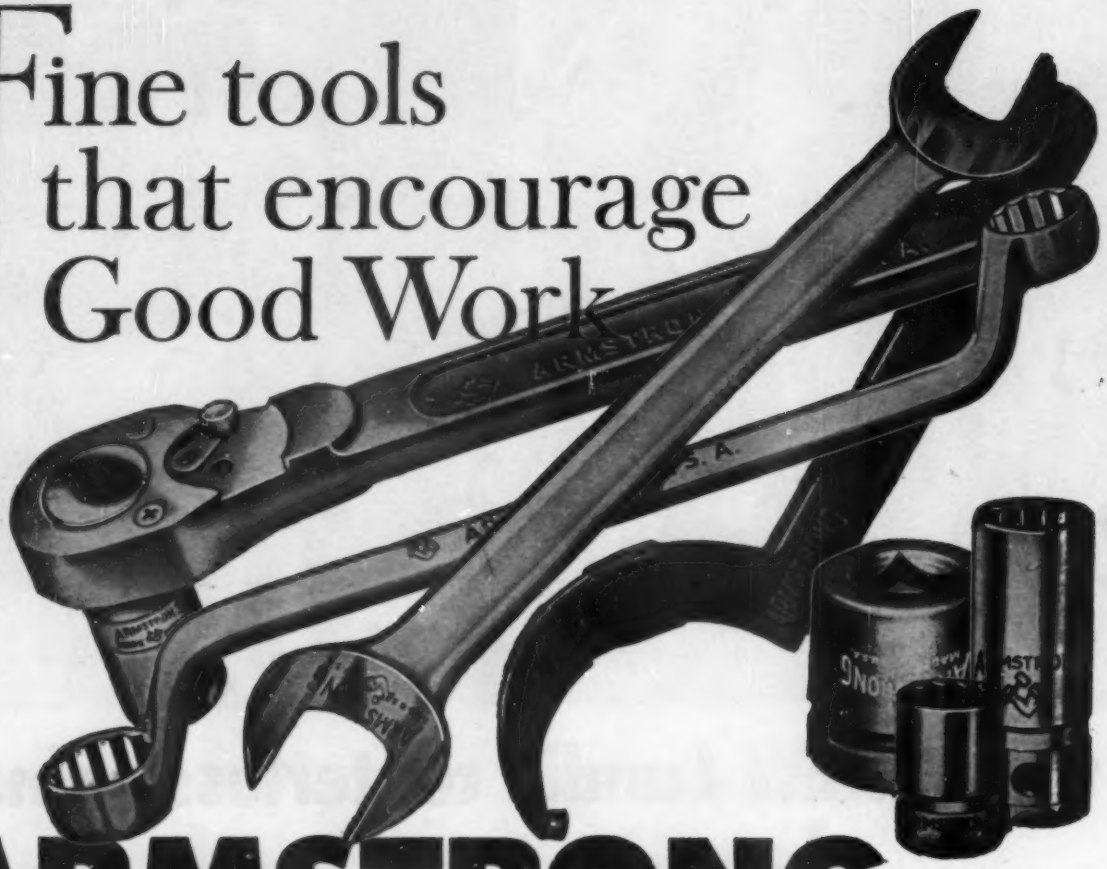
This completely new 12R machine is the finest centerless grinder available anywhere in the world. It will grind parts at a faster rate and to even closer tolerances than was possible before.

LANDIS

world leader in precision grinders

LANDIS TOOL COMPANY, WAYNESBORO, PA.

Fine tools that encourage Good Work



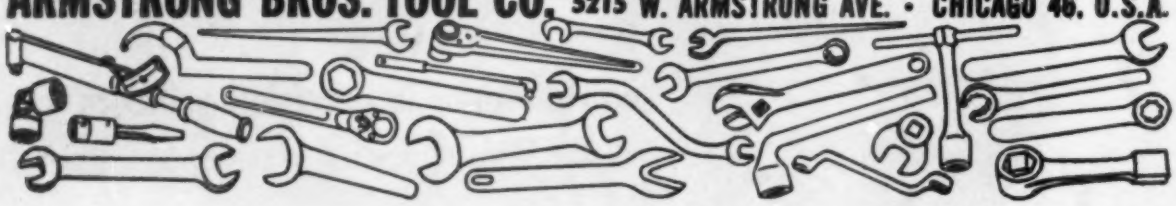
ARMSTRONG WRENCHES

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

INDUSTRIAL DISTRIBUTORS · THE RIGHT HAND OF PRODUCTION ·

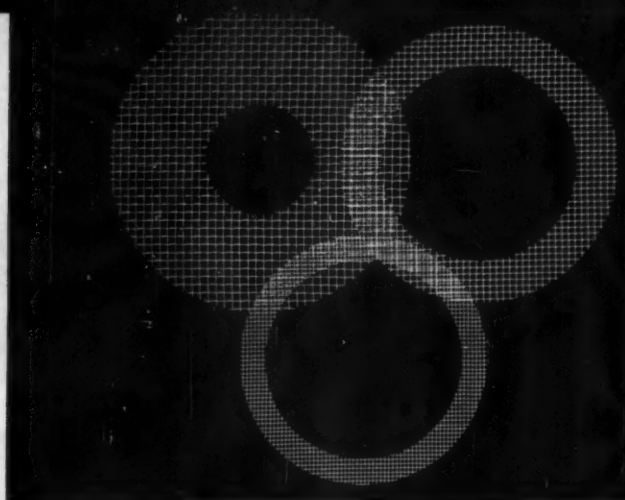
If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. · CHICAGO 46, U.S.A.

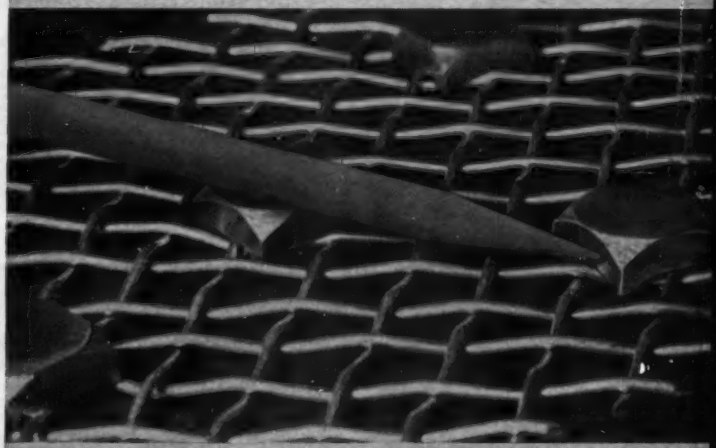


DISC SAFETY AND ECONOMY

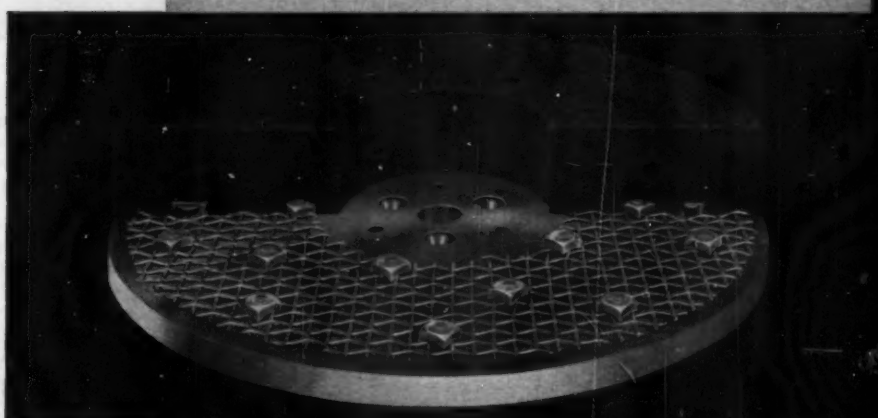
with Gardner Wire-Lokt® construction



Heavy steel wire mesh becomes firmly embedded in the abrasive structure, actually forming a part of the abrasive backing.



Special steel anchoring nuts lock securely into wire mesh. In manufacture, abrasive is forced around and under steel mesh and nuts.

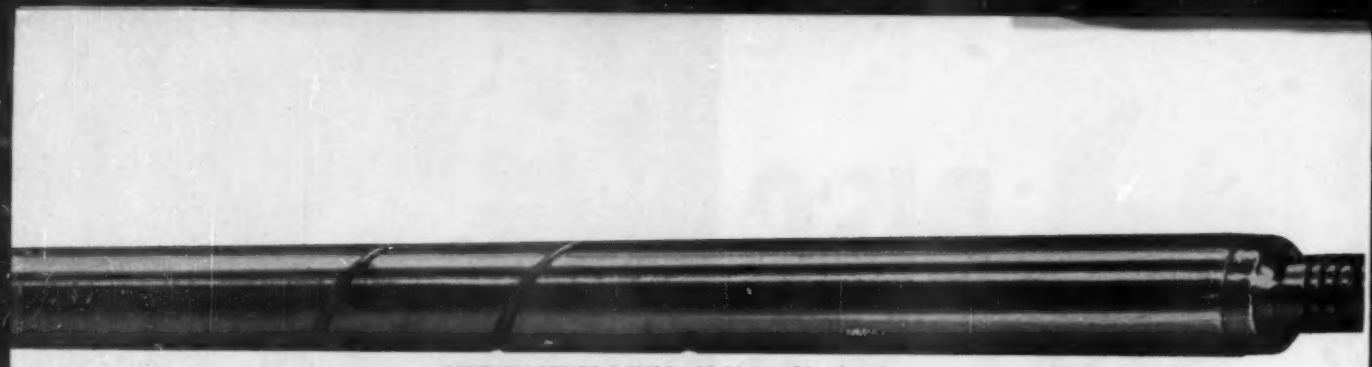


Full value is assured because usable abrasive extends right down to Wire-Lokt backing.

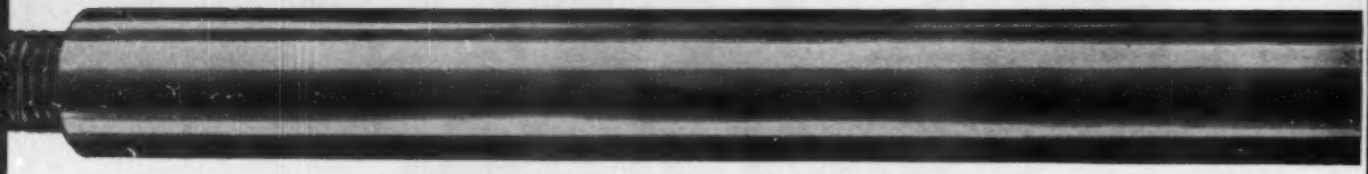
GARDNER

abrasive discs

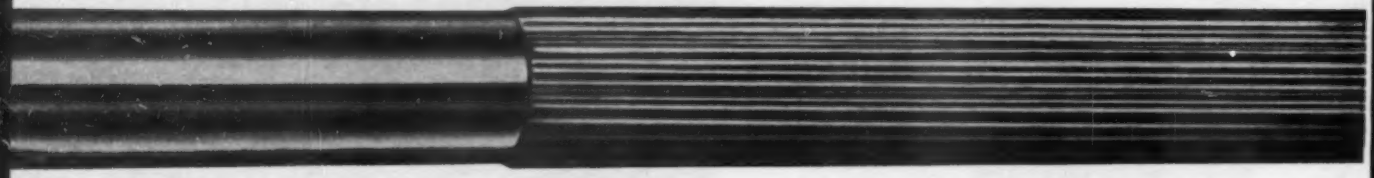
BELOIT, WISCONSIN



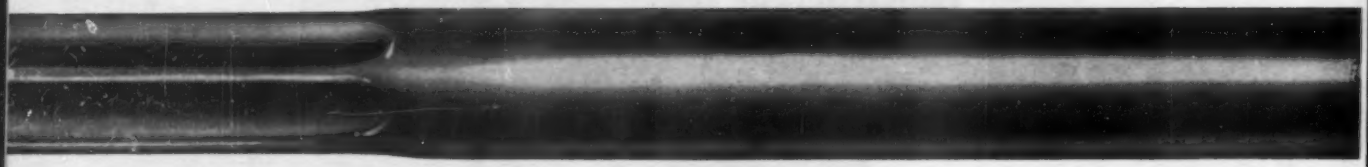
CENTURY SERIES C-1144 for highly machined parts.

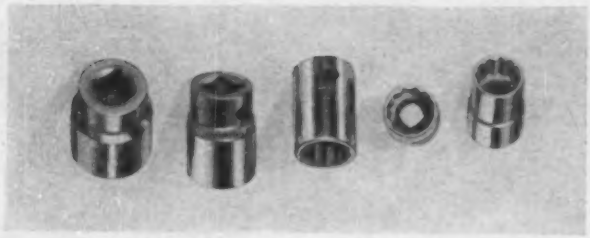


CENTURY SERIES C-1141 and C-1151 for moderately machined parts.



CENTURY SERIES C-1050 and C-1045 for parts where machinability is a minor factor.





WRENCH SOCKETS, made by Herbrand Division of The Bingham-Herbrand Corporation, Fremont, Ohio, illustrate the kind of application where the superior strength, toughness, and machinability of *Republic Cold Finished Alloy Bars* help produce a better product at lower cost.

Bars are formed, drilled, and cut off in an automatic screw machine, then hot broached to shape internal dimensions. Final stages of socket production include heat treat and chrome plating. Mail coupon for more data on Republic Alloy Bars.

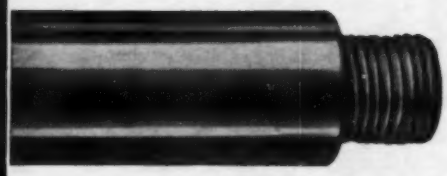
ROTOR BUCKETS for *Mechanical Drive Turbines manufactured by* Elliott Co., Jeannette, Pa., are produced from *Republic Stainless Steel Special Sections . . .* an excellent example of how Republic Special Sections save money on tough-to-make parts.

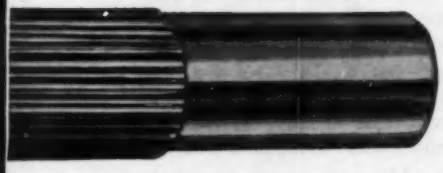
User benefits include: simplified machining, corrosion and abrasion resistance, greater strength and hardness, smooth surfaces that reduce or eliminate finishing operations. Available in a wide range of sizes and contours . . . carbon, alloy, stainless steel, and titanium. Send coupon.

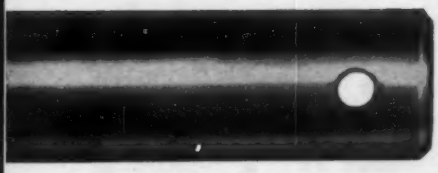
Steel

Strong, Modern, Dependable

Cut Material Costs on High Strength Parts







Republic CENTURY 100 SERIES Cold Finished Bars

LET YOU CHOOSE FROM 5 GRADES, 5 DEGREES OF MACHINABILITY, 5 PRICE LEVELS

With Republic's CENTURY SERIES of high strength, stress relief annealed, cold finished steel bars, you pay only for the machinability you need to meet your production requirements. CENTURY SERIES bars are priced on a descending scale (as machinability decreases, price drops). This makes it possible for you to realize important savings by selecting lower-sulphur-content, high-strength-toughness-ratio bars for applications where machinability is not of prime importance. Each of the five grades has a minimum yield strength of 100,000 psi.

PRODUCTION FACILITIES for CENTURY SERIES bars are strategically located in key metalworking markets to serve you better. Result: faster deliveries, and expert metallurgical service, *when you need it,* on the complete line of Republic Cold Finished Steel Bars. For more information on CENTURY SERIES bars and Republic Metallurgical Services, send the attached coupon.

REPUBLIC STEEL

REPUBLIC HAS THE FEEL FOR MODERN STEEL

CIRCLE 264 READER SERVICE CARD

REPUBLIC STEEL CORPORATION
DEPT. AM-1565-B
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Send more information on:

- ☐ CENTURY SERIES
- ☐ Cold Finished Stainless Steel
- ☐ Cold Drawn Special Sections
- ☐ Cold Finished Alloy Steel

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

why Servo uses NIKON OPTICAL COMPARATORS

SERVOTHERM® infrared detectors are thermister bolometers manufactured by Servo Corporation of America for military and industrial use.

The sensitive nerve cell of a thermister bolometer consists of two semi-conductor elements with high negative temperature coefficients. These elements are appropriately called 'flakes', for each is hardly more than 1/250th of a square inch in area, and only .0004 inch thick.

These 'flakes' must be flawless, and must pass rigid inspection for critical dimensions, positioning in the cell, solder junctions, and for possible defects. They are so fragile that no ordinary mechanical inspection means can be used.

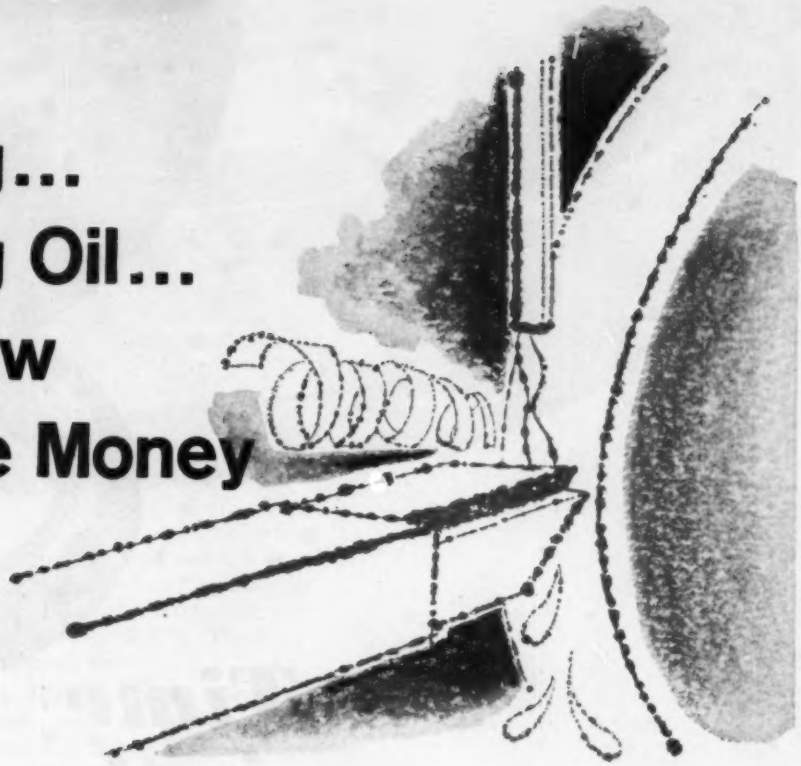
Servo Corporation has solved this inspection problem by using a Nikon Model 3 Optical Comparator. A sharp, bright, highly magnified image of the 'flake' appears on the comparator screen where it is conveniently, quickly and accurately inspected, and precise measurements made to within .0001 inch. No tool touches the 'flake'.

Use of the Nikon Comparator has enabled Servo to achieve quality standards which would have been quite impossible, by any other means. SERVOTHERM® bolometers are rated among the most accurate and reliable in the field today.

Why not investigate what a Nikon comparator can do for you? For complete details, write Dept. AM-6.

NIKON INCORPORATED INSTRUMENT DIVISION · 111 FIFTH AVENUE, NEW YORK 3, N. Y.

Turning... Cutting Oil... and How to Save Money



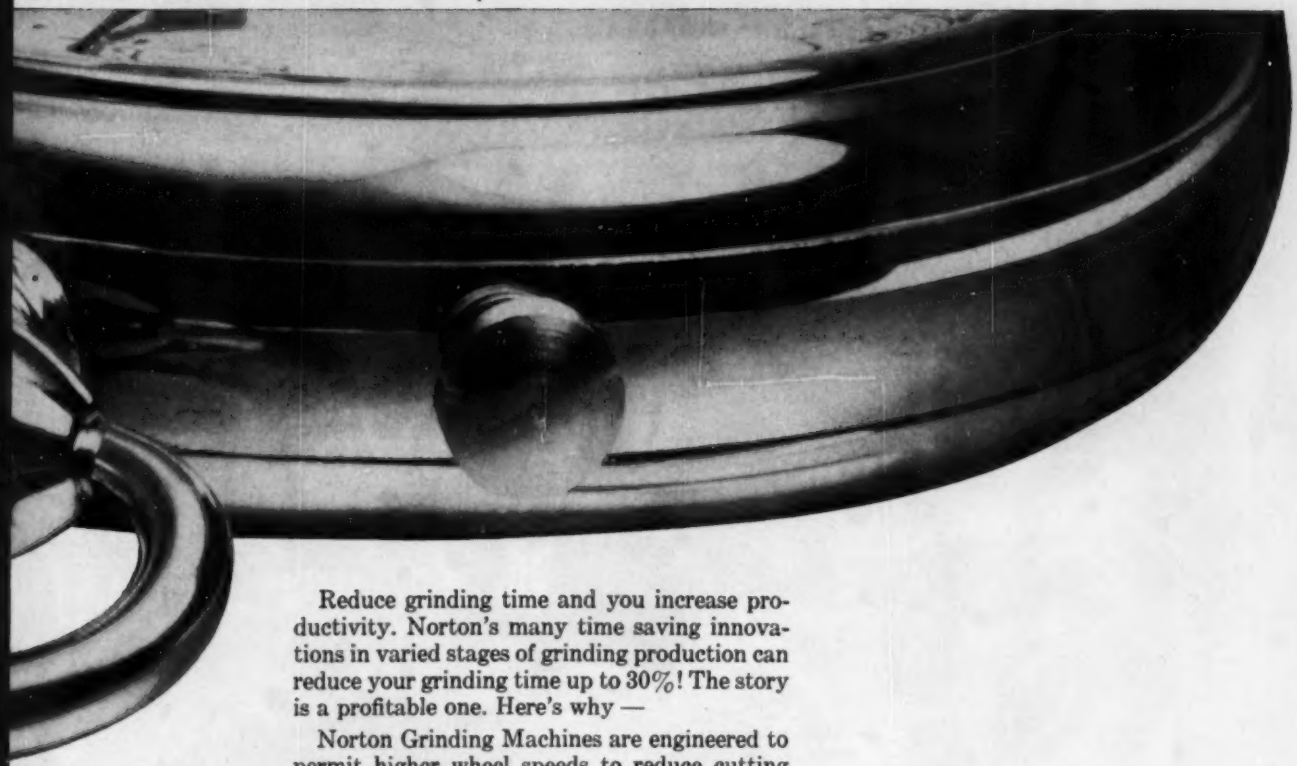
You can cut costs by switching to the one oil that does the job of two—Sinclair Clairo Oil. This dual-purpose oil has earned a reputation as both a cutting oil and a machine tool lubricant. Moreover, you use the same Clairo Oil for cutting ferrous and non-ferrous metals, eliminating changeover and contamination. Tests prove Clairo Oil gives up to 200% greater tool life. Next time management asks how you've cut costs, tell them you're using Sinclair Clairo Oil—and show them the results.

Call your Sinclair Representative for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There is no obligation.

Sinclair

Sinclair
Clairo® Oils

Time is the measure of productivity



Reduce grinding time and you increase productivity. Norton's many time saving innovations in varied stages of grinding production can reduce your grinding time up to 30%! The story is a profitable one. Here's why —

Norton Grinding Machines are engineered to permit higher wheel speeds to reduce cutting time. Norton's *Automatic Wheel Balancer* balances the wheel in *five seconds — on the machine.* You reduce time spent "grinding air" up to 85% because of Norton's *Automatic Wheel Contact Accelerator* which speeds the wheel to the work and compensates for work piece-diameter variation. Another advance is Norton's *Automatic Truing* which eliminates work interruptions and the *Automatic Wheel Wear Compensator* that stabilizes the grinding cycle.

Norton Grinders further add to your productivity by minimizing work spoilage with *Automatic In-Process Gaging.* In the case of surface grinders Norton *Higher Table Speed of 150 fpm* actually reduces grinding time up to 50%.

These are only some of the many reasons you can increase your productivity with Norton Grinders. They also offer accessories that literally transfer skills to machines — *ultra-fine feed,* and *automatic features* such as *steady resting, endwise locating, loading, constant peripheral wheel speed* and *hydraulically-operated feed screws* provide this competitive advantage.

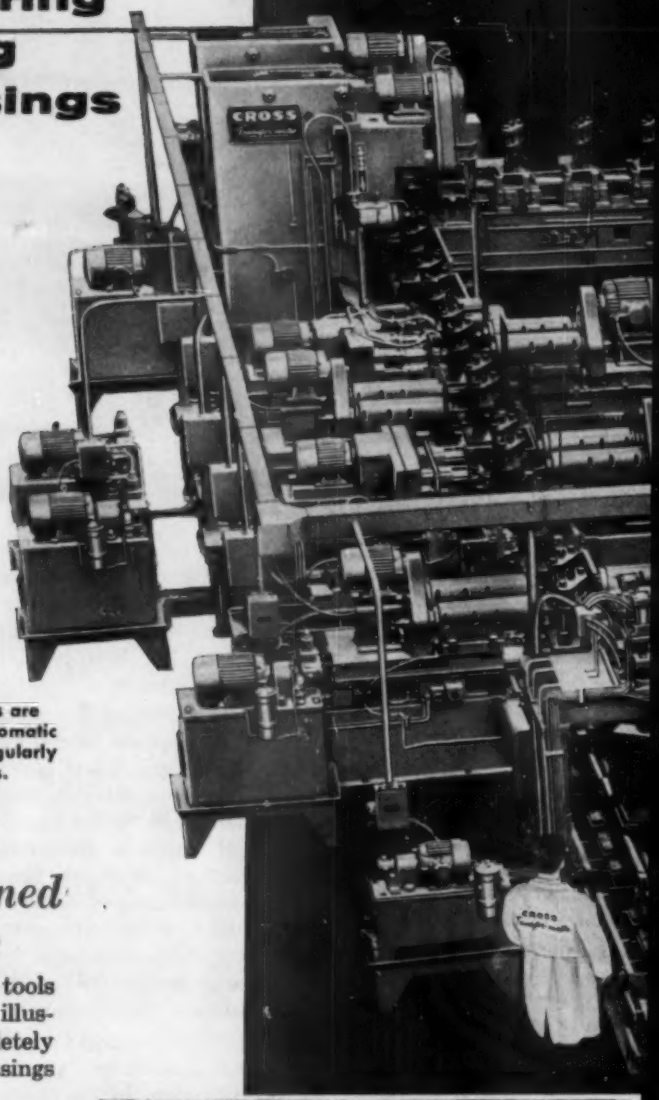
The decision is yours — can you afford not to reduce the time it takes to produce your product? Can you afford not to increase your productivity? Contact your Norton man, NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.

NORTON
MACHINE TOOLS
... Making better products to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines — B & E DIVISION: Shapers • Gear Cutting Machines

Milling, Drilling, Boring and Assembling Steering Gear Housings

Close tolerances are maintained in automatic processing of irregularly shaped parts.



New Transfer-matic Designed to Prevent Obsolescence

A typical example of how transfer type machine tools can be designed to guard against obsolescence is illustrated by this new Cross Transfer-matic. It completely machines and assembles power steering gear housings except for the mounting feet.

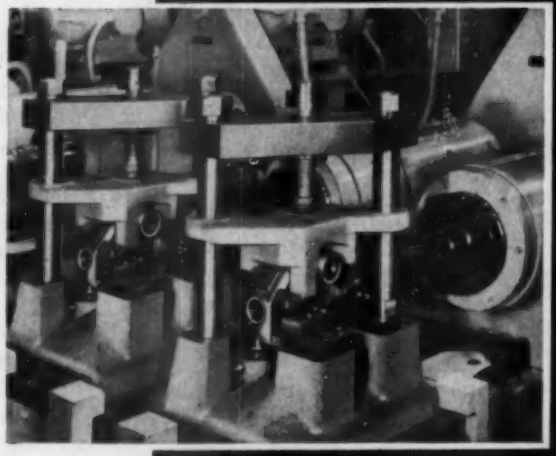
Useful life has been materially increased by building the Transfer-matic to process housings with longer pitman shaft extensions than those now being produced. Three idle stations permit other operations to be added and the use of standard Cross "building blocks" provides further flexibility for part design changes.

Present operations include milling, drilling, boring, counterboring, spot facing, chamfering, tapping, deburring, and assembling the worm thrust bearing cups and the pitman shaft bushings in the housings. Rated production is 300 pieces per hour.

A special feature is the provision for off-line inspection of the pallets and the parts without loss of production.

Another feature is the provision for in-line inspection at three different stations and final inspection just before the assembly operations.

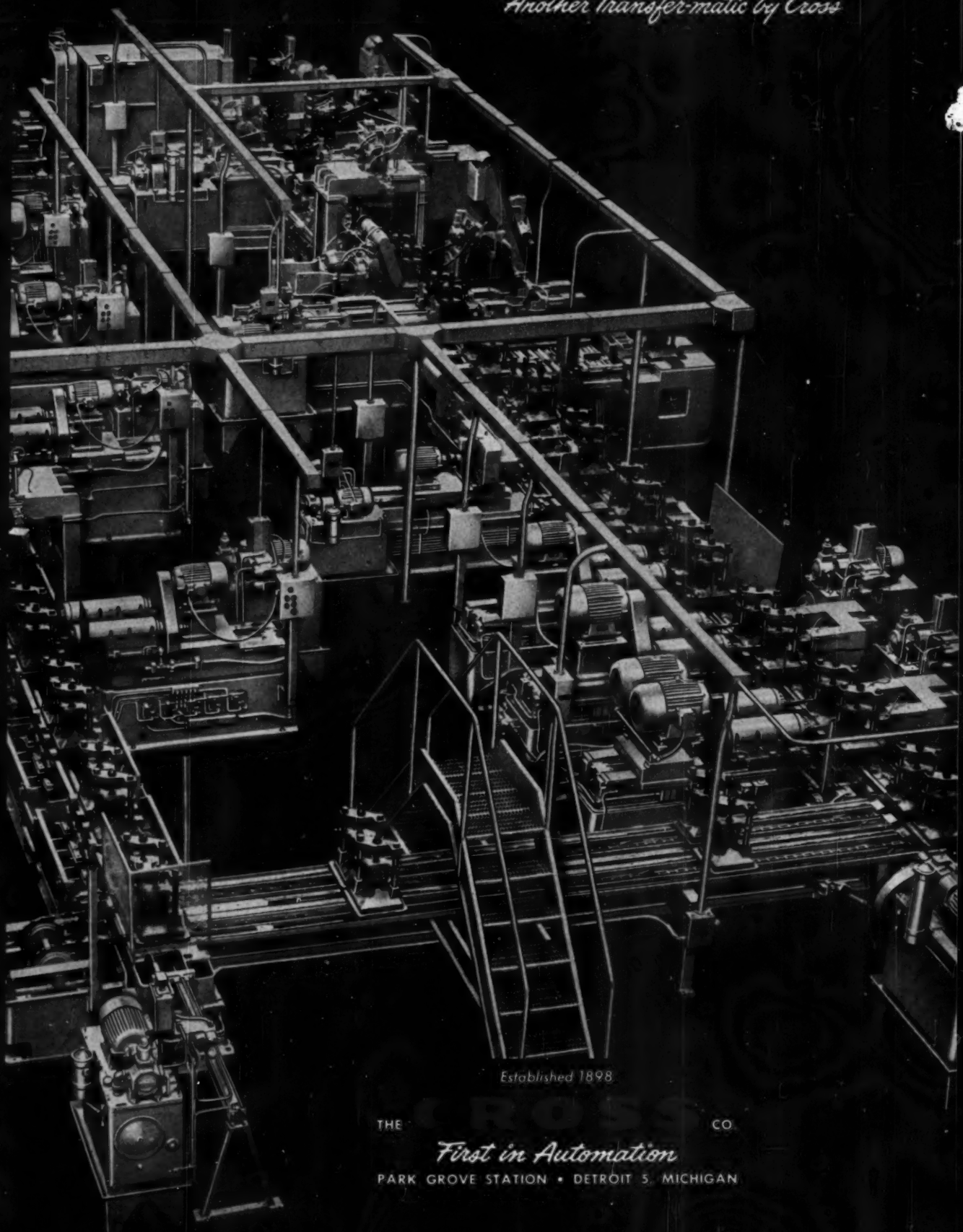
If you would like to know more about these and other Cross innovations, just drop us a line.



Precision boring of the worm shaft hole—two at a time.

CIRCLE 269 READER SERVICE CARD

Another Transfer-matic by Cross

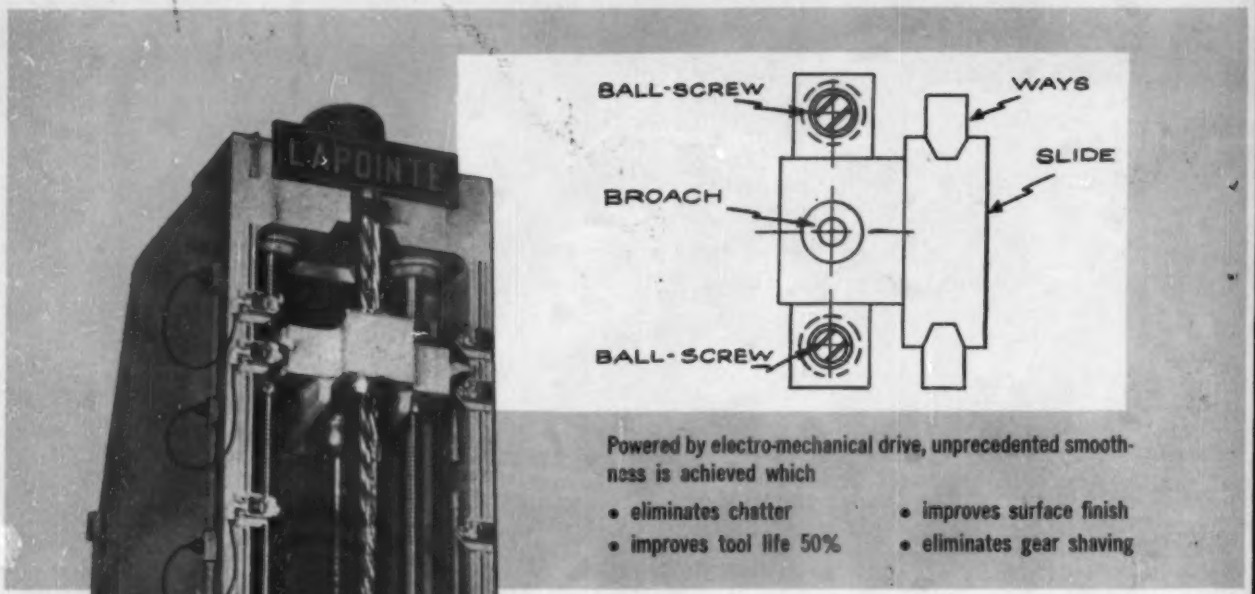


Established 1898

THE CO.

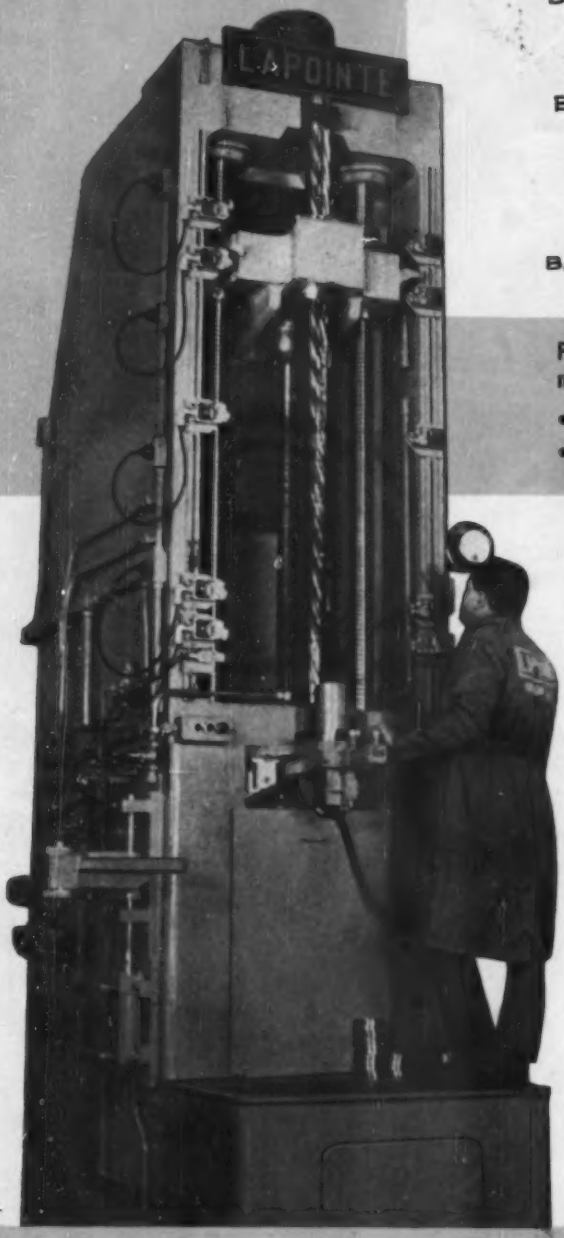
First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN



Powered by electro-mechanical drive, unprecedented smoothness is achieved which

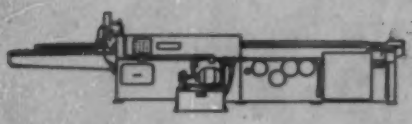
- eliminates chatter
- improves tool life 50%
- improves surface finish
- eliminates gear shaving



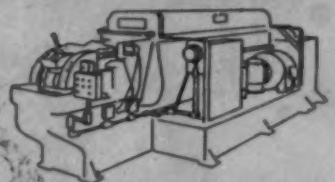
Automotive Pump Gear, for automatic transmission. Gear has 29 helical involute splines broached from 2.913" hole. Gear shaving is eliminated.

Illustrating the VUE-4 (vertical pull-up type) LAPOINTE special 30 h.p. electro-mechanical drive Broaching Machine with 72-inch stroke. Designed with infinitely variable speeds ranging from 5 to 40 f.p.m. Matched ball screw drive provides fast broaching speeds and permits the use of the full length of stroke.

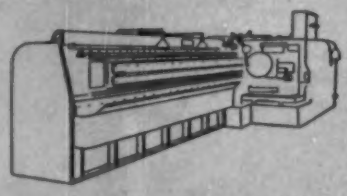
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

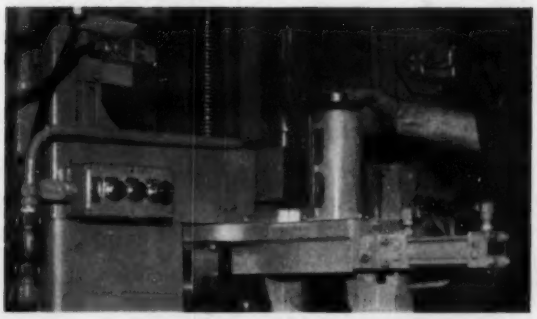


SRHE SINGLE RAM HORIZONTAL, ELECTRIC

the LAPOINTE answer to the PRODUCTIVITY CHALLENGE

a completely new principle in **BROACHING MACHINE** design!

. . . providing direct in-line pull on the broach by using a pair of matched ball screws



Gears are broached in 30 seconds! Production is 120 per hour at 50% efficiency, using 20 f.p.m. broaching speed. Parts are automatically loaded from a tube-type magazine, broached two-at-a-time, and automatically ejected.

This is the first of a complete series of Lapointe horizontal and vertical internal broaching machines to be built on the principle of *direct in-line pull* using precision twin ball screws.

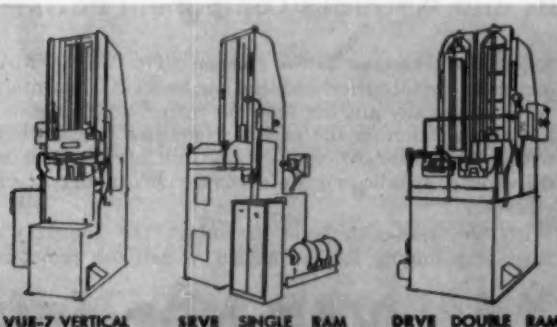
Smooth . . . accurate. Helical gear manufacturers say that the remarkable accuracy and smoothness of this broaching operation does away with the necessity for gear shaving in making accurate gears. There are unlimited other applications where this new Lapointe-Broaching principle will eliminate finishing operations.

It is expected that this new engineering design will revolutionize broaching, providing important benefits from broaching that were not available before. Lapointe engineers are always in the lead with new broaching developments . . . and *this* is one that you shouldn't overlook. Why not write us today for full information?

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL FULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

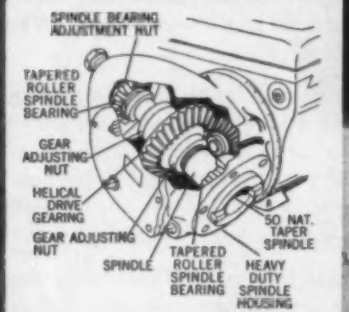
LAPOINTE

known to be the best in

BROACHING

Van Norman's Industry-Integrated Design Has Industry Talking!

Heavy duty Adjustable Cutterhead, standard on Nos. 1R, 1RQ, 2R, 2RH and 38MA Van Norman Milling Machines.



Cutaway view of Adjustable Cutterhead showing heavy duty construction. Spindle bearings are sealed and lubricated for life.

VAN NORMAN RAM-TYPE MILLER SLASHES ...SAVES TIME—WILL PAY FOR

Adjustable Cutterhead Dovetails and Machines Component Parts—

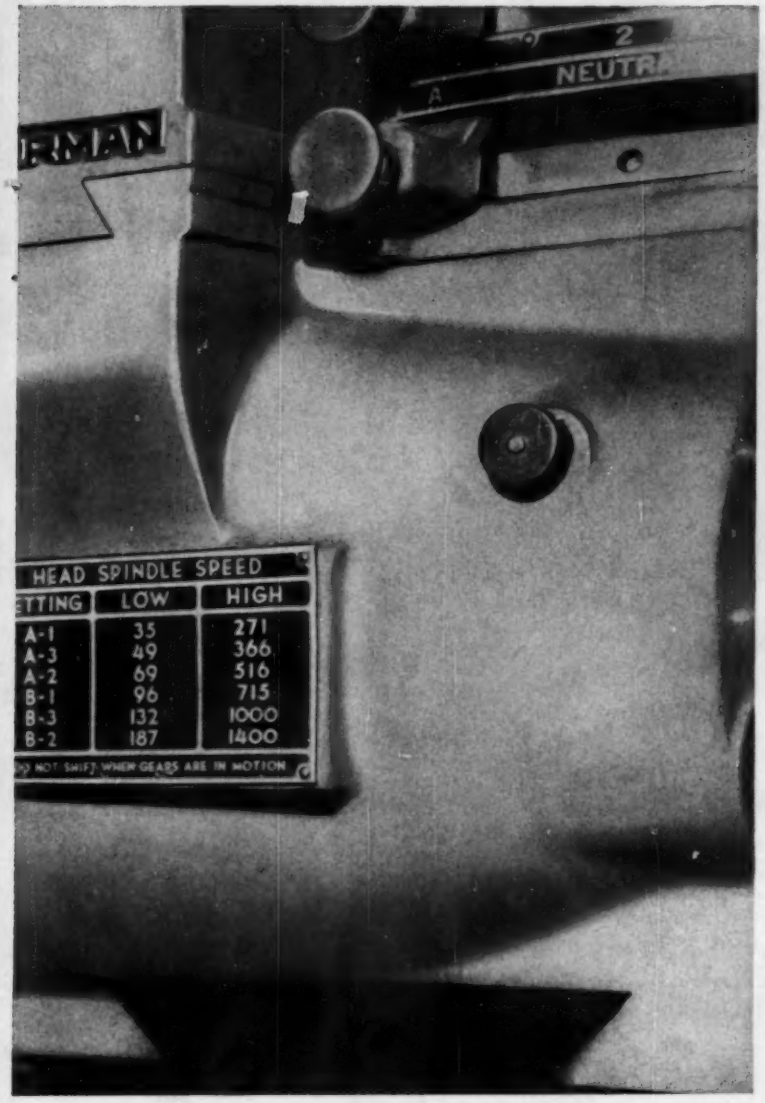
A large metalworking manufacturer cut component part production 15% when they bought a VN 38 MA Ram-Type Miller. This low-priced, low-maintenance miller replaced three machines formerly needed to get accuracy in the finished work.

In addition, the 38 MA, because of tremendous range capability, also serves as a jack-of-all trades around the shop. It performs drilling, slot milling, slab milling and face milling while machining to tolerances of .001".

Adjustable Cutterhead Solves Problem—The VN 38 MA features a swivel cutterhead that can be set in horizontal, vertical and any angular location within a 90° angle—locks in position on the ram to guarantee precise cuts within the entire 29" ram range. Full horse power is delivered to spindle *in any position* for maximum cutting efficiency.

With the ram-cutterhead assembly, the company's three-step milling job is finished in half the previous

VAN NORMAN
SPRINGFIELD 7, MASSACHUSETTS


2
NEUTR
A
HEAD SPINDLE SPEED
ETTING | LOW | HIGH
A-1 | 35 | 271
A-3 | 49 | 366
A-2 | 69 | 516
B-1 | 96 | 715
B-3 | 132 | 1000
B-2 | 187 | 1400
DO NOT SHIFT WHEN GEARS ARE IN MOTION

PRODUCTION COSTS 15% ITSELF IN 3 YEARS

Spindles... Flanges... Castings

time—and they expect the 38 MA to pay for itself in three years.

Greater Accuracy . . . Less Downtime—The VN 38 MA is specifically engineered to produce more—better . . . at less cost. The addition of a backlash eliminator controls table feed under all conditions.

Get the Complete Facts—Your VN franchised dealer is ready to show you how a VN milling machine can cut costs and speed production in your shop. Call him today.

MACHINE COMPANY
A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED

VN

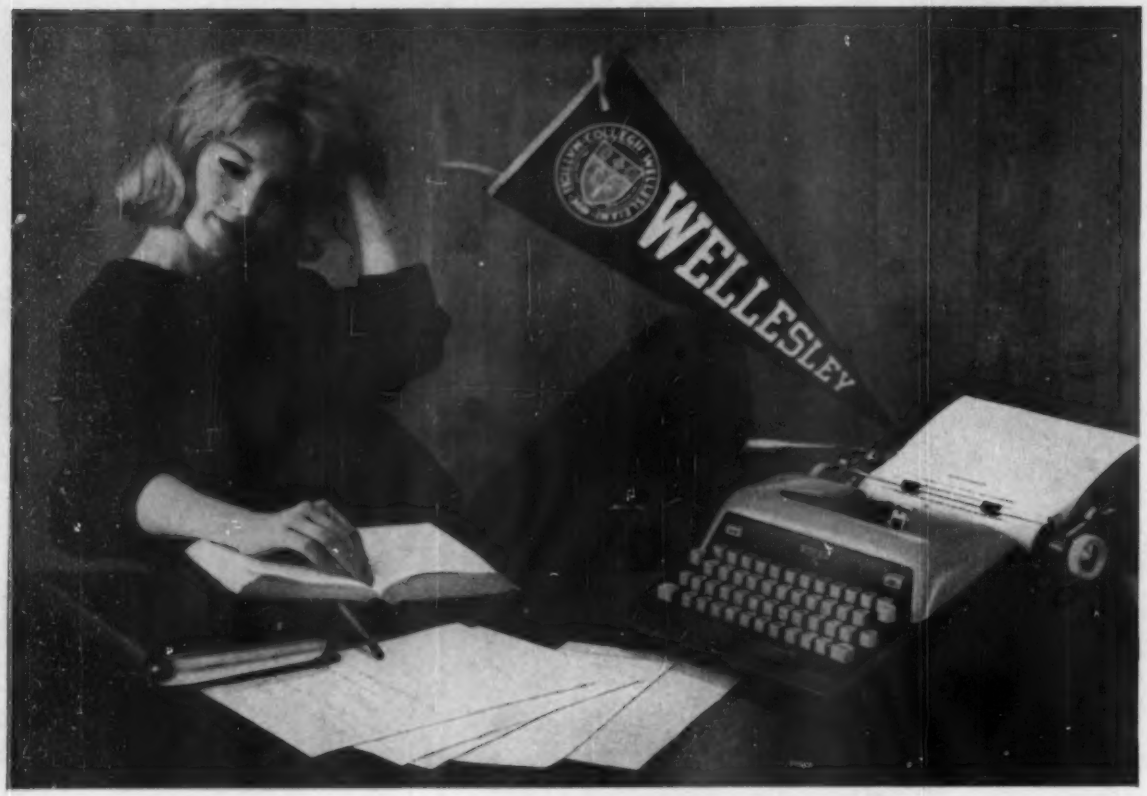
Another typical Van Norman milling machine cost-saving application

A leading manufacturer and fabricator of industrial plastics, wanted speed of production, versatility, and accuracy in a milling machine.

They found this with Van Norman . . . as demonstrated when they ordered seven *additional* VN Milling Machines after they achieved such out-standing results with the first—production speeding results that paid off in cold cash.

Production Time Cut 25% to 30%—With the new VN Milling Machine, the company cut production time 25% to 30% . . . an enormous cost factor. Moreover, the VN Milling Machine gave more varied production . . . was easily adaptable for a wide range of jobs. And gave more accurate, unsupervised production.

Once set, the VN Milling Machine ran indefinitely on a particular job without rechecking . . . and delivered the same precision and fine tolerance on the last piece milled as it did on the first.



TAKEN FOR GRANTED

. . . She's concerned about the theme due next week. Never any doubt about the performance of her ROYAL PORTABLE which she "beats" on the average of 20 hours a week. Reliability's taken for granted—the greatest compliment you can pay any product.

Royal McBee Installs 2 Meaker Automatic Plating Machines to Process Over 150 Royal Portable Typewriter Parts

Much of the taken-for-granted reliability for which ROYAL PORTABLE TYPEWRITERS are famous is due to the precision plating of over 150 components done on 2 MEAKER AUTOMATIC PLATING MACHINES. One unit takes care of the entire production requirements for chrome plating — plus an equal amount of nickel plated parts. The second MEAKER plates over 100 different components in bright or "black" zinc.

Reports Mr. C. H. Farrington, Production Manager of Royal McBee's new "showplace" plant in Springfield, Mo.: "We particularly like the custom designed automatic programming on our MEAKER. We plate nickel and chrome or just nickel on one unit, and either bright or "black" zinc on the other, in any sequence desired."

Since 1899, THE MEAKER COMPANY has designed and built automatic equipment for continuous or batch-type metal finishing for large or limited production requirements. Our experience has shown that many medium size shops can pay for a MEAKER AUTOMATIC in labor savings and consistent quality production alone.

Our latest catalog "WHEN TO AUTOMATE" will give you some valuable ideas on improving your profits picture through automatic metal finishing or plating.

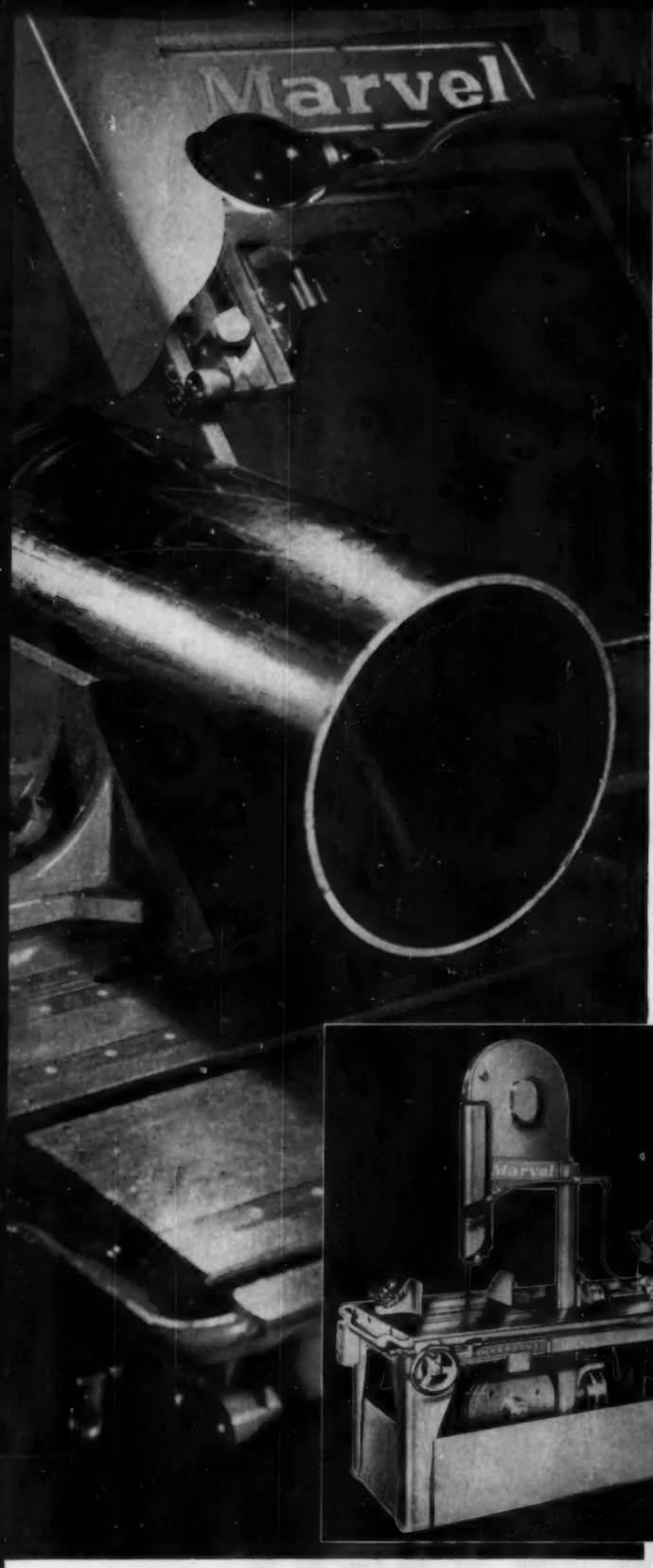
MEAKER

THE MEAKER COMPANY

SUBSIDIARY OF SIL-REX CORPORATION

Nutley 10, New Jersey

Factories and offices Chicago 50, Ill., Los Angeles, Cal. and Nutley 10, N. J.



Problem:

One Straight Cut... *One Miter Cut*

Solution:

One MARVEL No. 8 Band Saw

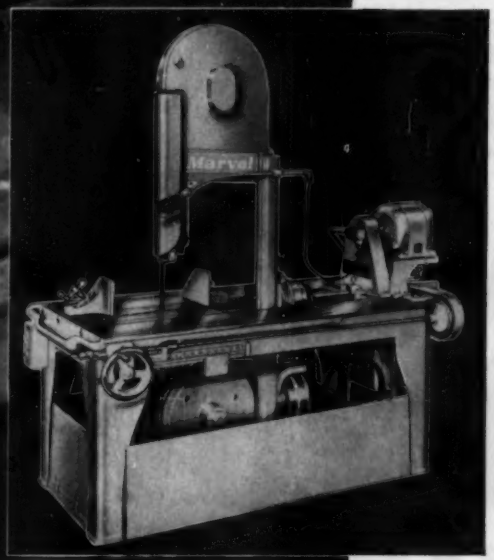
Recently, a MARVEL Field Engineer was called on to help solve a troublesome production sawing operation.

He found that a straight cut and a 45° miter cut were required on a 10" diameter pipe prior to welding it into an assembly. Production was slow, cutting costs were climbing to alarming proportions, and too many pieces were being rejected because one or both cuts were not meeting accuracy standards.

The trouble was easy to find. A makeshift arrangement was being used to do the job. After the straight cut was made, the miter was laid out and the pipe swung out into the aisle so that the saw could make the angle cut. Excessive work handling slowed production, valuable floor space was taken up, and accuracy became increasingly difficult to maintain.

Recommending a MARVEL No. 8 Universal Band Saw solved the problem. When the MARVEL Field Engineer showed how the Saw's column and blade can be tilted up to 45° right or left of vertical and fed straight into and through the cut at the pre-determined angle *while the work remained stationary on the table,* the production superintendent recognized the answer to his problem. He also saw, how the built-in protractor would eliminate all layout.

Result: another MARVEL No. 8 Universal Band Saw went to work for a new user.



Cutting miters quickly and accurately is just one of a hundred jobs that can be done on the versatile No. 8 Universal Band Saw ...the most useful—and used—metal cutting saw on the market. Get complete information on this time and cost saving band saw today. Write for Catalog 875.

Marvel No. 8 Universal Metal Cutting Band Saw
Capacity: 18" x 18"

MARVEL *Metal Cutting* **SAWS**

BETTER MACHINES BETTER BLADES

ARMSTRONG-BLUM MANUFACTURING CO. • 5700 Bloomingdale Avenue • Chicago 39, Illinois

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In metalworking—men who matter read...

American Machinist / ***Metalworking Manufacturing***

A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N. Y.

If you sell to metalworking, ask your customers to tell you which business publications they find most useful in their work—then advertise there. Twenty-five companies conducted such surveys on their own during the last 10 years—and American Machinist/Metalworking Manufacturing was consistently the winner . . . hands down!

Reason? AM/MM is the technical publication of metalworking—and metalworking is a highly technical industry.

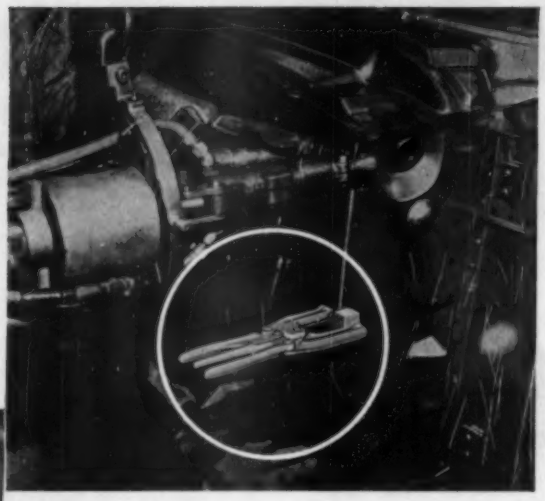
AM/MM concentrates on how-to articles, case histories and *working* information on the often highly complex methods and procedures involved in manufacturing things from metal more efficiently, more profitably. In short, it's a 26-times-a-year work book. If metalworking is your market, it will work for you.

For up-to-date facts and figures on metalworking, ask your AM/MM *district manager for a copy of the 1960 Market Guide for Sales Executives.*

No. 2 of a series

Look what clamps are doing!

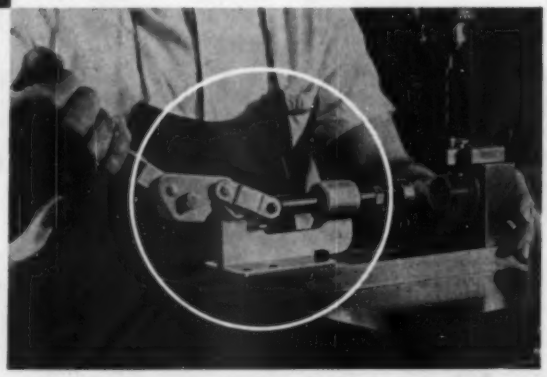
Practical uses of Wespo Toggle Clamps and Pliers that may suggest ways you can save



Low Cost Wespo Toggle Pliers have a myriad of uses in assembling operations—as portable clamps, clamping where space is limited, or overhead clamping. Their usefulness as portable clamps is demonstrated in this auto body welding operation. The plier shown has the Wespo "Quick-Trigger" release which permits one hand operation. All Wespo toggle pliers are engineered for fast, positive locking with a minimum amount of hand pressure. They are available in numerous styles and jaw sizes.

This Wespo Push-Pull Clamp serves as a simple fixture to hold a knurled ring securely during the drilling operation. The adjustable spindle is fitted with a large pad which mates with the inside diameter of the ring, holding it securely. Wespo makes a variety of push-pull clamps for use where smooth, horizontal clamping action is required. All models feature the "better 3-ways" Wespo design and are ruggedly built to stand hard use. Some models have locking action in both the "push" and "pull" positions.

Miniature Toggle Clamps, only 2½" overall!—These small, light weight Wespo Series 50 Clamps can do a hundred different jobs on small fixtures such as the one shown above. Their compact design and smooth operation also make them useful in the assembly of small parts, in electronic wiring and soldering operations, on fixtures where space is limited... anywhere a small, rugged clamp is needed. Maximum holding pressure is 35 lbs. Available with a horizontal or vertical mounting base; adjustable spindle.



NEW 16-PAGE WESPO CLAMP CATALOG!

More than 80 different models and sizes of clamps are described to help you quickly select the proper clamp for every clamping job.

Ask your Wespo Distributor for a free copy today.

WESPO

DIVISION OF VLIER ENGINEERING CORPORATION
A SUBSIDIARY OF BARRY WRIGHT CORPORATION
26935 W. Seven Mile Rd., Detroit 19, Michigan
Formerly West Point Manufacturing Company

CIRCLE 279 READER SERVICE CARD

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THIS CINCINNATI®
shears heavy plate

Paragon Bridge & Steel Co., Novi, Mich., cuts costs as it cuts heavy plate with this Cincinnati Shear:

Operators cut production time with rapid, easy gaging and adjustment; no need for changing knife clearance to cut different thicknesses of metal.

The Cincinnati Shear also permits square shearing, notching, and slitting operations.

This machine can trim an edge to one-half the thickness of a sheet or plate. Furthermore, longer knife life is obtained from extra-size, four-edge knives.

Whether you're considering a mechanical or hydraulic shear, the broad Cincinnati line offers you maximum advantages for your plate shearing requirements. Write for your copy of a Cincinnati Shear catalog.

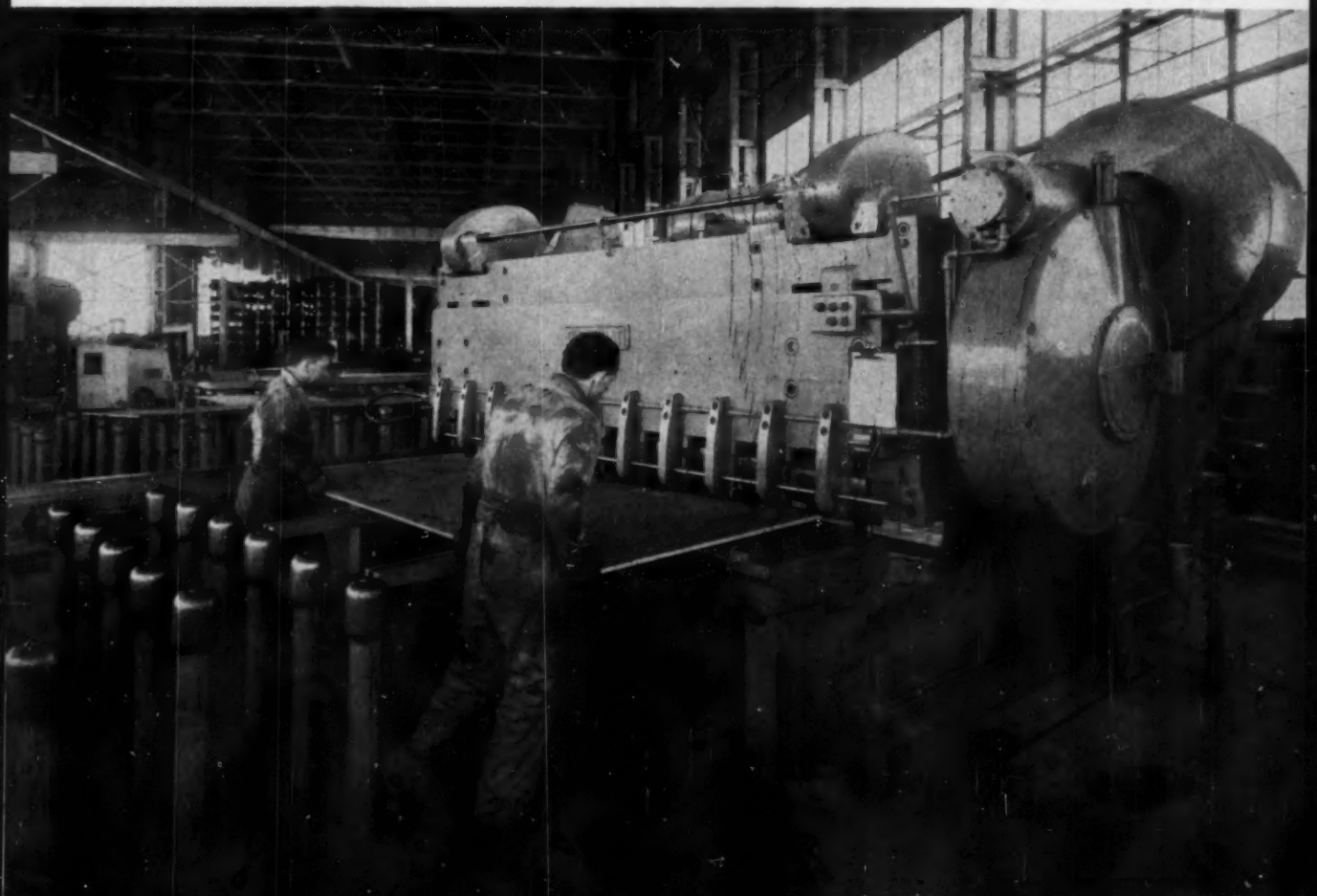
Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

United Kingdom: The Cincinnati Shaper Co., Ltd., Glasgow, Scotland

Courtesy Paragon Bridge & Steel Co., Novi, Mich.



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MASTER COLLETS and PADS

The Only Master Collet with
No Work Pressure On The Screw

Available For: Cleveland-Cone
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National Acme—New Britain
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MASTER FEED FINGERS and PADS

Pads Cannot Work Loose
No Screws — No Pins

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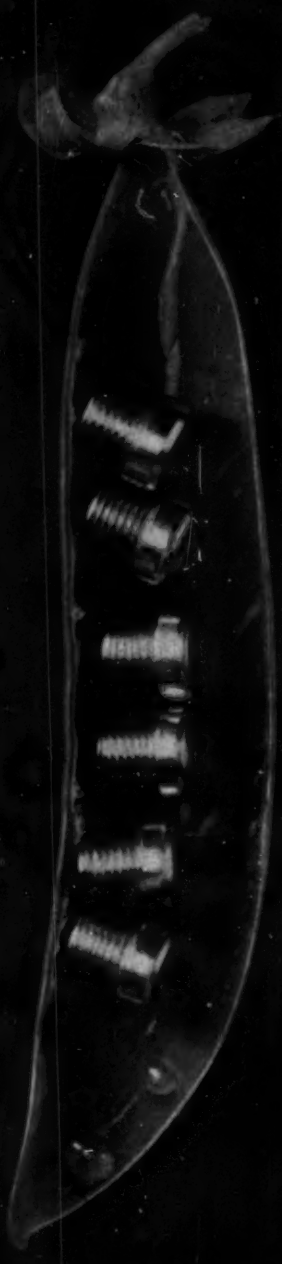

Micro-Chip is all alike!

It's consistent. Like peas in a pod . . . parts made of Micro-Chip are all alike. Kaiser Aluminum's new 2011-T3 consistently delivers small chips . . . faster machining . . . minimum tool resetting . . . uniform machinability throughout every bar, from bar to bar and lot to lot. Call your Kaiser Aluminum Distributor for "Micro-Chip" 2011-T3.

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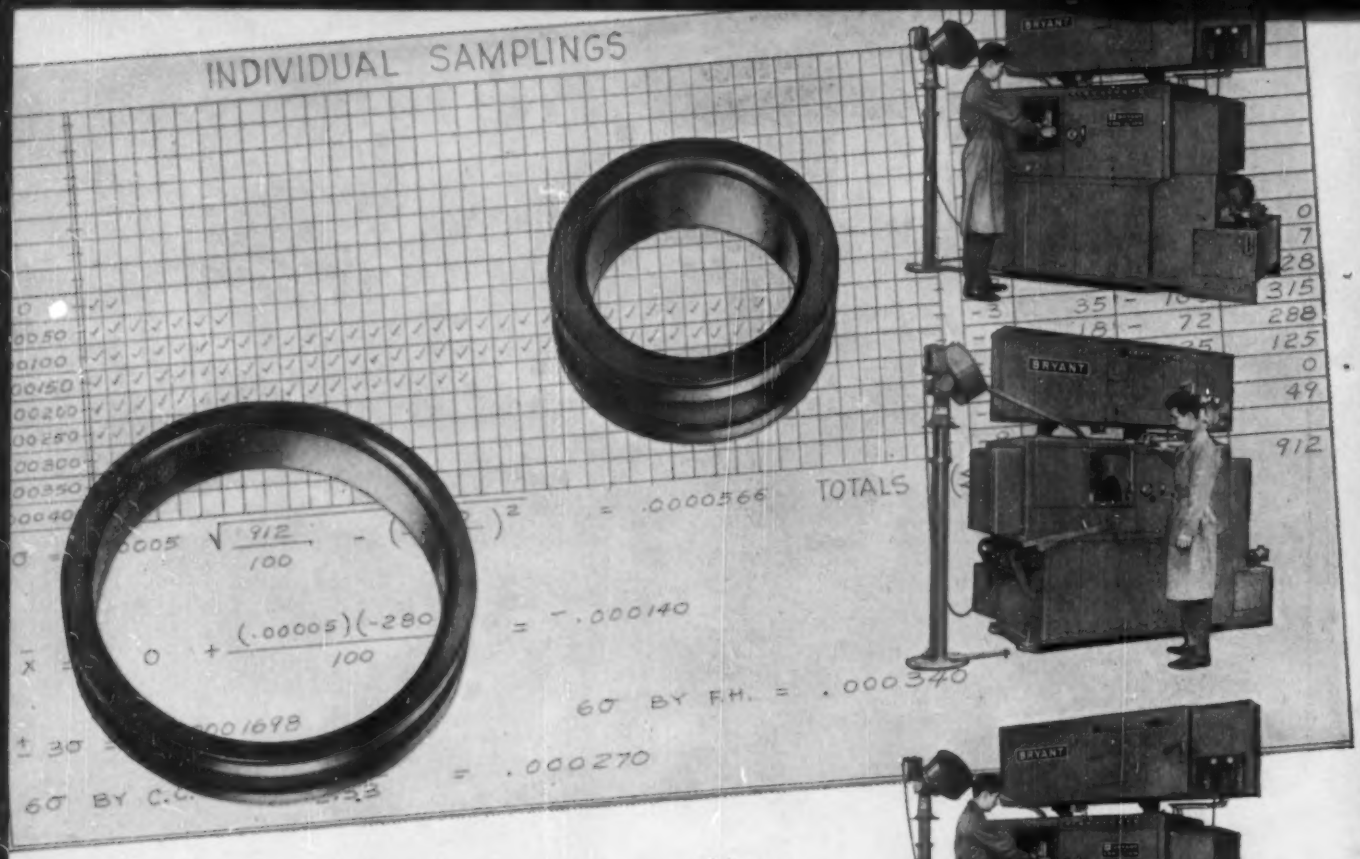
ASK YOUR KAISER ALUMINUM DISTRIBUTOR FOR YOUR 1961 ALLOY COLOR CODE CHART • NEW LEADERSHIP IN THE WORLD OF ALUMINUM



TAKE A LONG HARD LOOK AT GRINDER PERFORMANCE...

The Model "C" Centalign® is ideal for long run, high production grinding of straight bores, tapers, and bearing raceways.

Capability, reliability and durability — not initial cost alone — are the yardsticks to use in selecting a production internal grinder.

The frequency histogram illustrated above is just one of many capability tests used to prove out *all* Bryant production internal grinders. Tests such as this one (which tabulates the quality characteristics of workpieces ground) are your assurance of predictable, day-after-day production quality when you purchase a Bryant.

Precise engineering and a constant effort to maintain the highest degree of reliability in manufacturing result in solid durability. Proof: the many Bryant internal grinders operating with minimum attention and down time in all major production lines.

For full details on how Bryant internal grinders can improve your profit picture, consult your nearest Bryant or Ex-Cell-O sales representative.

BRYANT

Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT, U.S.A.

Internal Grinders • Special Machinery

CIRCLE 283 READER SERVICE CARD

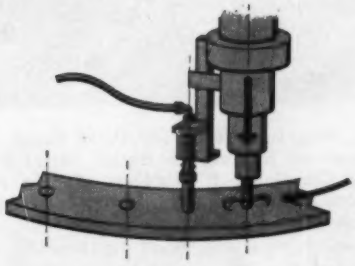
How 1 pneumatic recorder at GE led to 14 more

The first one did such a good job that General Electric's Evendale, Ohio, plant bought an additional 14 Sheffield pneumatic recorders, for application to automatic indexing jig borers.

An adjustable bracket on the quill holds a floating air spindle. After each hole is bored, the spindle enters the hole, automatically records the bore size. If the hole is within limits, the next hole is bored. If the diameter is not within specifications, the operator is warned by both lights and a buzzer.

The Sheffield Pneumatic Recorders proved so reliable that dimensions recorded at the machine have—in many cases—eliminated the need for subsequent inspections.

Write for Bulletin PREC.-212.



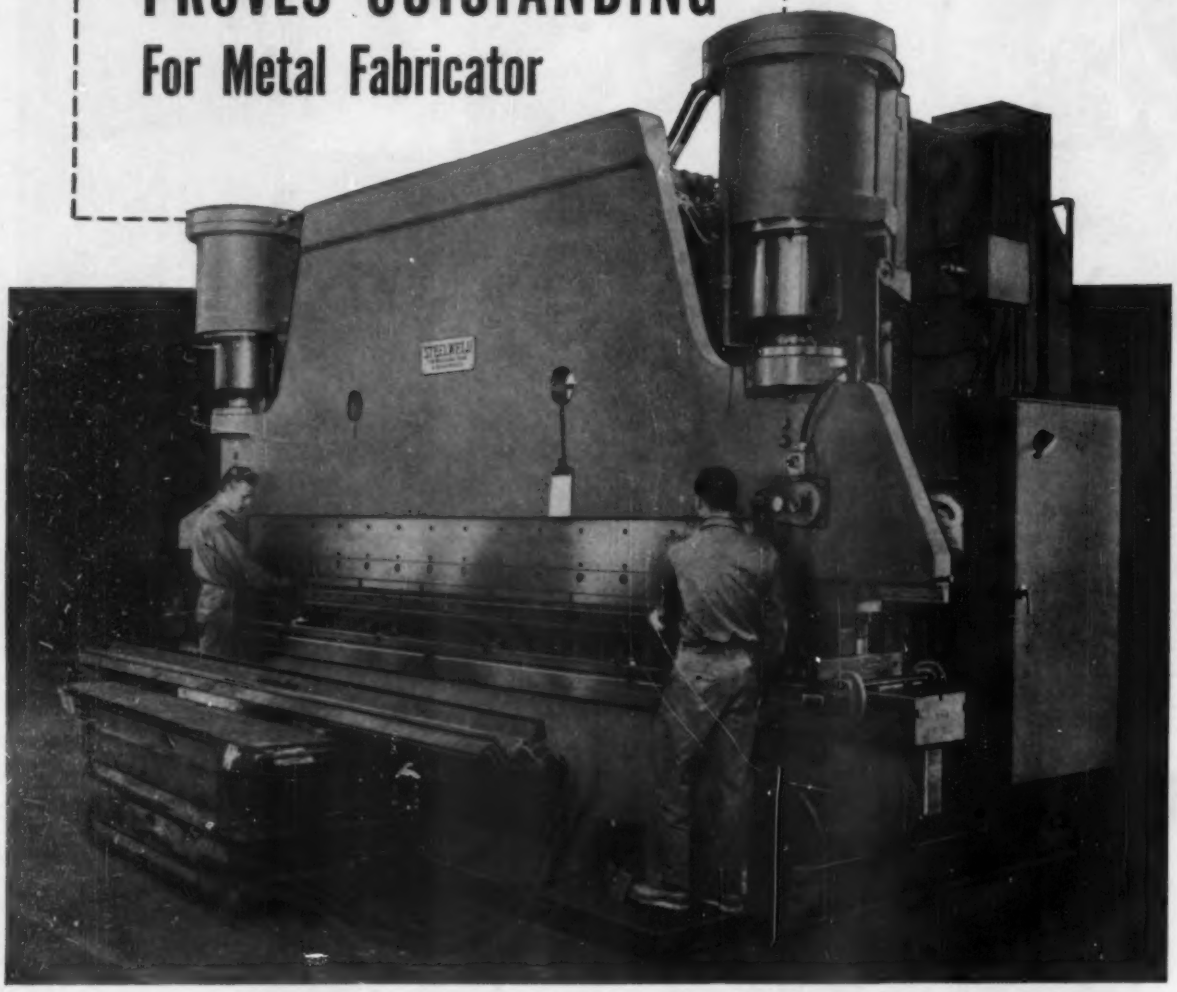
The SHEFFIELD Corporation Dayton 1, Ohio

A subsidiary of The Bendix Corporation

Inspection Gages, Dimensional Control Instruments, Machine Controls, Automatic Gaging & Assembly Systems, Measuray® X-Ray Thickness Measuring, Crushtrue® & Multiform® Grinders, Cavitron® Ultrasonic Machine Tools, Press-Pacer® Transfer Units, Large Dies, Tooling, Contract Manufacturing.

Hydraulic Press Brake PROVES OUTSTANDING For Metal Fabricator

Model MH16-14 Steelweld Hydraulic Press Brake. Overall bed and ram length 20'-0". Capacity 650 tons.



A 650 ton Steelweld Hydraulic Press Brake is a mighty important tool at The Bargar Metal Fabricating Co., Cleveland. It performs a wide range of operations such as bending, forming, stamping, punching, drawing.

The brake is especially good for bending large plates, because the ram can be traveled at exactly the right speed to prevent whipping of the plate. Sometimes plates as large as 10' x 20' x ¼" are bent.

The machine is very useful for drawing operations, excelling mechanical press brakes for this work, because it can be operated at the speed that is most suitable for the metal. Also, the ram can be traveled through a greater distance because of the unusually long 16-inch stroke. The power is constant for the entire stroke.

Much punching is done with the Steelweld, and this work is speeded by adjusting the ram stroke to travel only slightly more than the thickness of the plate. The fact that the ram can be inched to the work and backed away whenever desired is another time-saving feature especially helpful when setting up dies.

The Bargar Company has one of the finest and most completely equipped sheet metal fabricating plants in Cleveland. The Steelweld Brake is a good example of their modern production facilities.

Write for free booklet No. 2024

STEELWELD
MECHANICAL and HYDRAULIC
PRESS BRAKES

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

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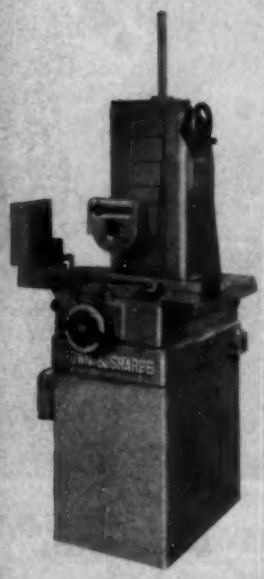
Now there are

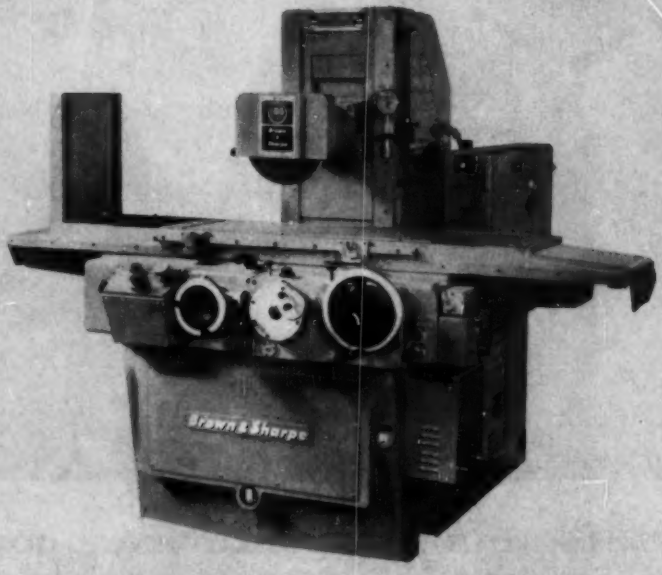
6

Brown & Sharpe MICROMASTER

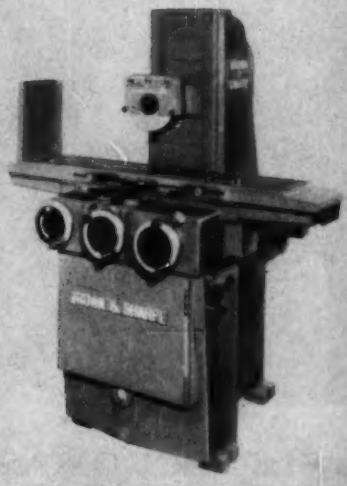
Surface Grinding Machines



510



824 • 1024 • 1030 • 1224



618

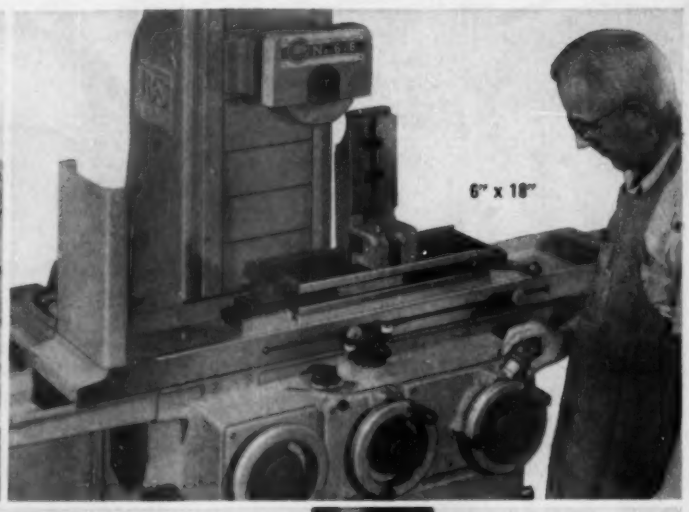
to help you make more for less...

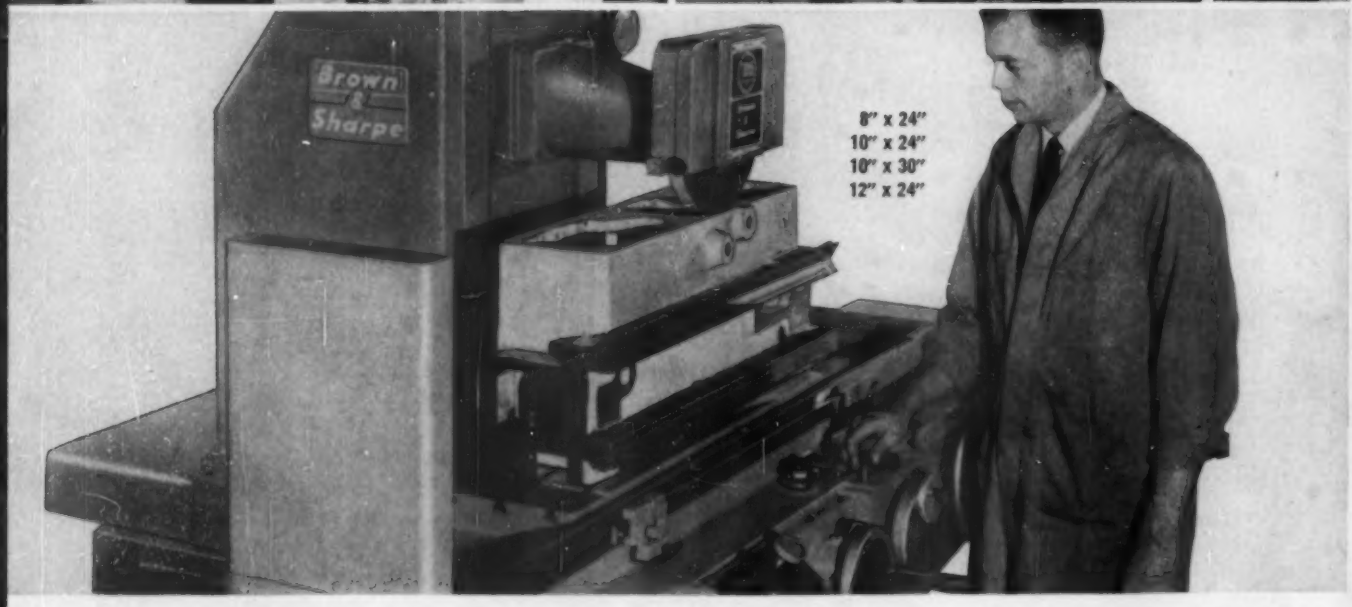
Brown & Sharpe

PRECISION CENTER

MMT·PE

TO HELP YOU GRIND MORE FOR LESS





Six MICROMASTERS – in over 100 different combinations for profit-saving in any surface grinding work range

What are your special needs in a Surface Grinder? The new series of B&S MICROMASTERS permits you to select from 6 machine sizes and specify exactly the combination you want. You get — *and pay for* — no more capacity and features than you need.

Every MICROMASTER offers you all the benefits of Brown & Sharpe long-time leadership in surface grinder design. You get accuracies to tenths of thousandths, and fine micro-inch finishes. Simplified controls speed set-ups and reduce operator fatigue. Unit-type component design and automatic lubrication assure maintenance economy.

Get complete information, and you'll agree that MICROMASTER means "the most — in profit-saving advantages — for the money." Write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

Ask about 510, the popular hand feed MICROMASTER for tool and die shops, and other smaller work . . . the **618** MICROMASTER, with hydraulic and hand feeds, that sets cost-reduction standards for toolroom or production runs in the intermediate work range . . . the **824, 1024, 1030,** and **1224** hydraulic models that provide MICROMASTER super-precision and profit-saving efficiency for larger work and production runs.

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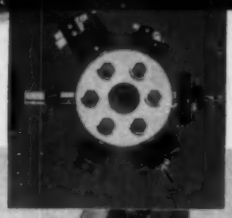
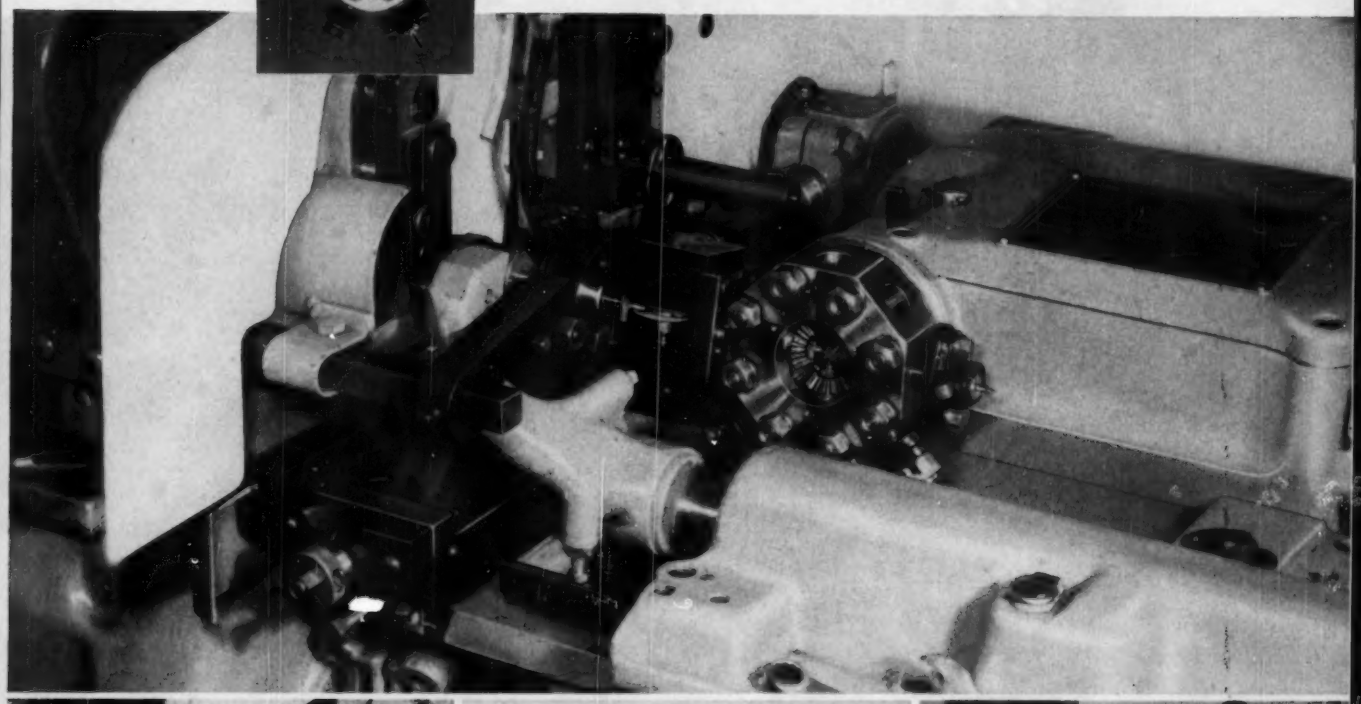
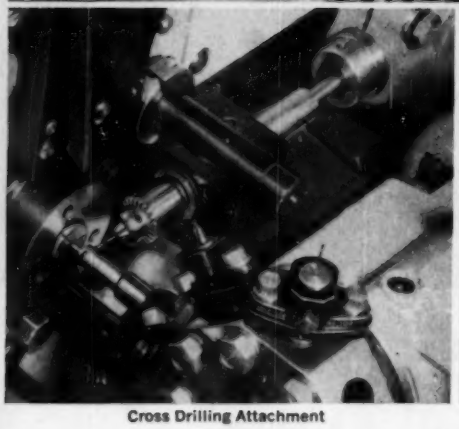
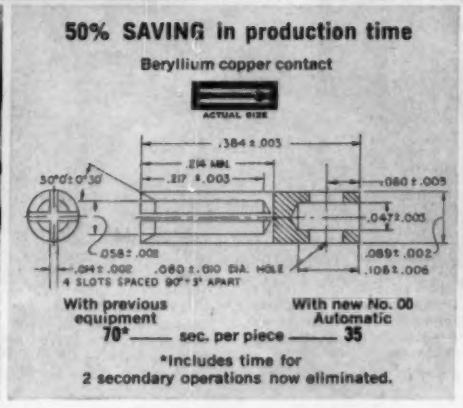


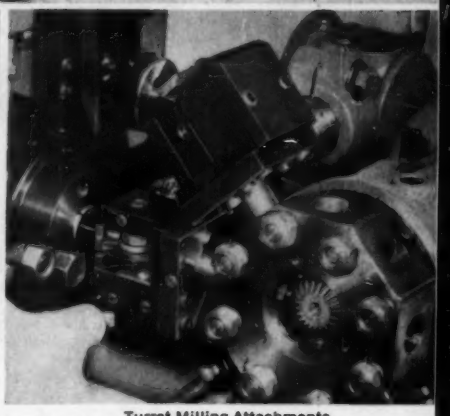
ASK ABOUT THE $500 TRADE-IN ALLOWANCE
ON OLD B&S AUTOMATIC SCREW MACHINES





Cross Drilling Attachment


50% SAVING in production time
Beryllium copper contact
ACTUAL SIZE
.384 ± .003
.217 ± .003
.060 ± .005
.047 ± .003
.058 ± .008
.089 ± .002
.106 ± .006
4 SLOTS SPACED 90° ± 3' APART
With previous equipment
With new No. 00 Automatic
70* —— sec. per piece —— 35
*Includes time for 2 secondary operations now eliminated.



Turret Milling Attachments

Beryllium copper part, with 10 machined surfaces, completed in 35 seconds on B&S No. 00 Automatic

Ten operations are required to machine the ⅛" dia. contact shown from tough beryllium copper bar stock. Unusual drilling, milling, and reaming cuts are made to tolerances of ±.001". The strict specifications also require a smooth, burr-free finish on all 10 machined surfaces.

The part is produced complete in 35 seconds on a Brown & Sharpe No. 00 Automatic equipped with an 8-hole turret and four standard Attachments. Two secondary operations formerly required are eliminated. Net production has been increased 100%. Besides cutting production time in half, other benefits are dependable piece to piece uniformity, longer tool life, and virtual elimination of burring.

This profit-saving performance is a typical example of the new design No. 00 Automatic's adaptability. On more and more jobs, it delivers production cost savings as high as 90%. Figure the daily dollar-savings you can make with the new-design B&S Automatics, and you'll see why you can write off the investment in record time.

B&S Screw Machine specialists will survey your operations at your request, and recommend new set-ups for savings. For complete information, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

Four standard B&S Attachments are used to eliminate secondary operations. The Cross Drilling Attachment (left) permits drilling cross hole during the 35-second machining cycle. The slots are milled with two Turret Milling Attachments (right). A Rear End Drilling and Burring Attachment is also used to drill the hole at the cut-off end.

Brown & Sharpe PRECISION CENTER

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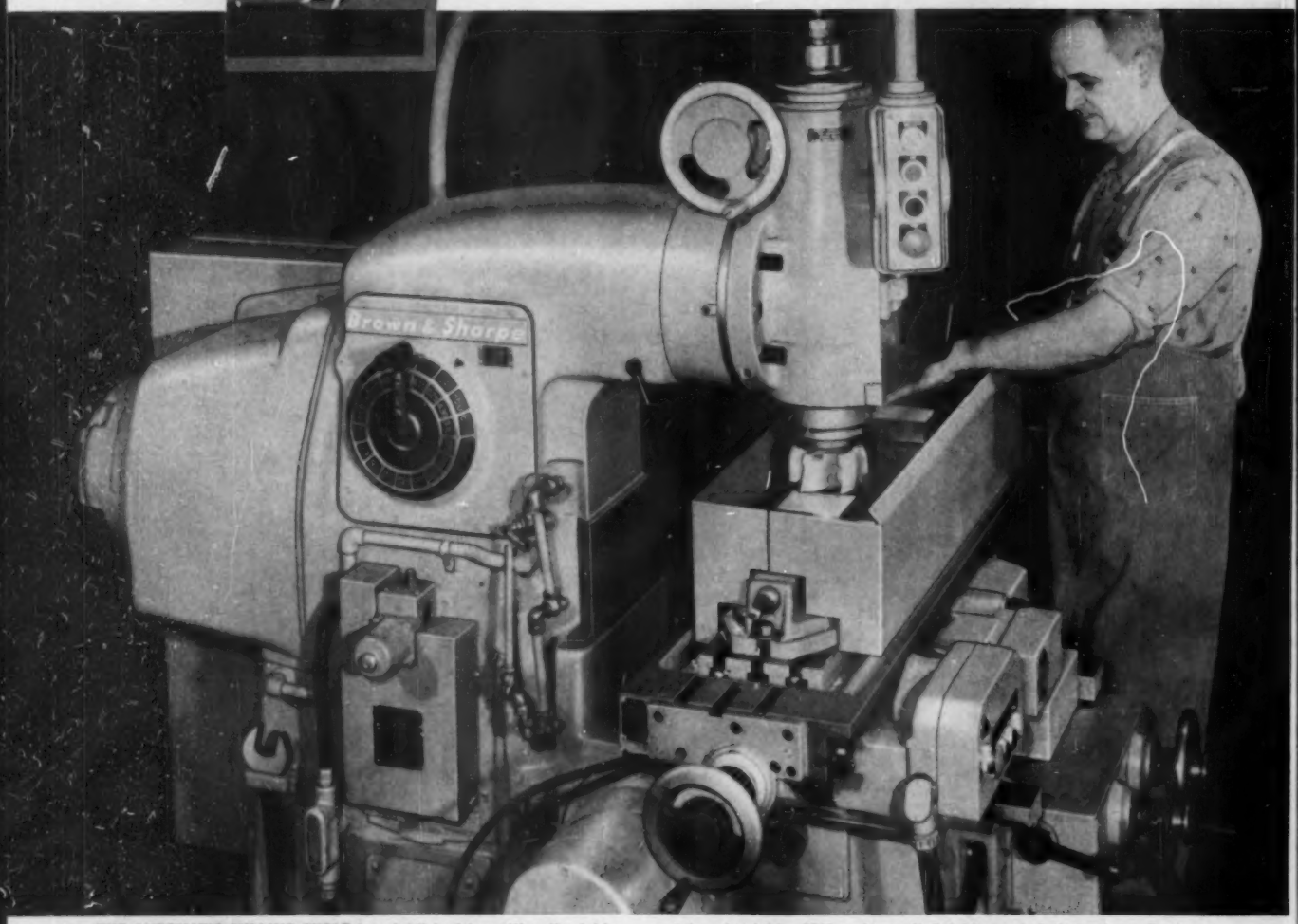
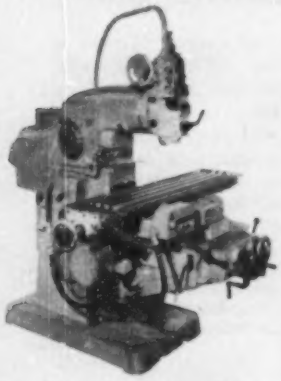
MMT-PE

TO HELP YOU MILL MORE FOR LESS



THE AUTOMATIC MILLING CYCLE is established by setting the table dogs. Operations are completely automatic. Operator simply loads and unloads fixtures. Rise-and-Fall Knee Positioning Arrangement drops the table .020" during fast return for cutter clearance. It may also be set to raise table .020" and permit finishing cut during return. Dual 10/5 hp spindle drive provides 10 hp (80 RPM to 2400 RPM) when needed for operations such as carbide milling. A simple selector switch converts to 5 hp (30 RPM to 1200 RPM). The High Feed Range permits feeds of ½" to 64" per minute.

DYNAMASTER Vertical, with standard arrangements, provides automatic carbide milling up to 2400 RPM



The "building block" construction of the new Brown & Sharpe DYNAMASTER Milling Machines permits you to order any combination of features needed. You get a standard machine with the standard optional mechanisms built-in, and avoid high cost of special modifications.

The No. 2 DYNAMASTER Vertical Milling combination illustrated includes dual 10/5 hp spindle drive, Automatic Cycle Arrangement, Rise-and-Fall Knee Positioning Arrangement, and High Feed Range. It provides the fast production potential of automatic twin-fixture milling at high carbide cutter speeds. With manual control, it easily handles all your conventional vertical milling jobs.

Before you buy milling machines for production, for toolroom, for experimental work, or for maintenance, get the complete story of the many advantages available only in the new DYNAMASTERS. No. 2 Universal, Plain, and Vertical — 3, 5, 7.5 and dual 10/5 hp — and the 3 hp Rangemaster — 132 cost-saving combinations. Write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

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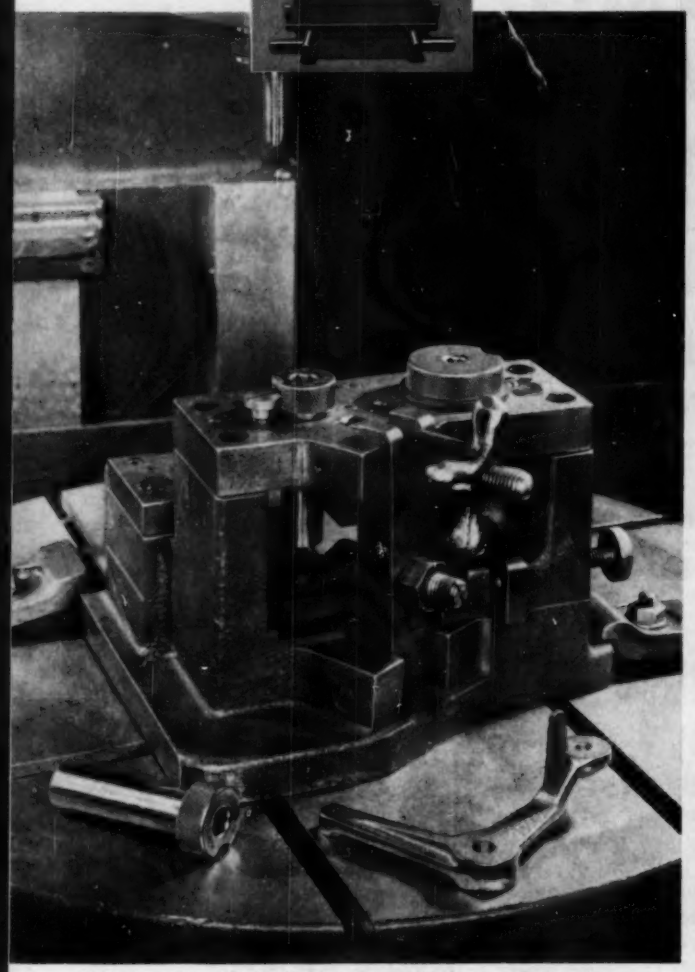
MMT·PE

TO HELP YOU DRILL AND TAP MORE FOR LESS



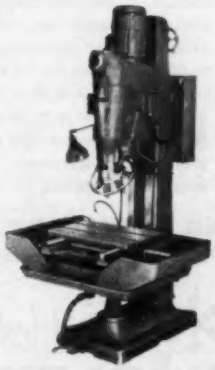
BEFORE — This complex jig was designed for use on a gang type drill press, then adapted to a B&S Turret Drilling Machine. Loading and cleaning is difficult and slow. Six operations are performed in 3 holes. Slip bushings are provided for some operations; others have to be done separately outside the fixture, since locations cannot be reached through the fixed bushings.

AFTER — This simple fixture holds the same part while all six required operations are quickly performed. The Positioning Table provides hole locating accuracy well within required tolerances· no bushings are needed in the fixture. The open design makes loading and cleaning easy. There is nothing to obstruct tool or table movement.

B & S Turret Drilling, with B & S Work-Positioning Table, eliminates complex fixture cost - speeds production

Brown & Sharpe Turret Drilling permits multiple drilling operations at a single station — and fast, accurate hole location without expensive jigs. These and other advantages can reduce your production drilling costs up to 80% or more. For *maximum* savings, it is essential to design tooling to take full advantage of all the benefits of the Turret Drilling method. The two fixtures illustrated are both designed to hold the same cast iron lever while it is machined on a B&S Model A Turret Drilling Machine. This comparison dramatically demonstrates how properly designed holding fixtures can eliminate complex, expensive jigs. Only a few hours are needed for design and construction of the simplified fixture Costs of production, as well as tooling, are drastically reduced.

Find out how much you can save with Brown & Sharpe Turret Drilling Machines and Positioning Tables — in work transfer and set-up time, in tooling costs, in tool wear and maintenance — in capital investment and floor space. Write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.



Brown & Sharpe PRECISION CENTER

CIRCLE 290 READER SERVICE CARD

MOST VERSATILE
general purpose • all-pneumatic
MARKING MACHINE

roll marks round or flat surfaces

precision graduates

serial numbers

ROLL-O-MARK

Noblewest ROLL-O-MARK is the world's most versatile general purpose marking machine. It produces sharp, clear, permanent indented impressions into metal, wood, plastic and other materials. Model 50P1, shown, has air powered work table and die slide. With Cyclomatic Control will mark up to 1500 pieces per hour. Other models with manual or semi-pneumatic operation. Write for specifications.

NOBLE & WESTBROOK MANUFACTURING CO.
17 Westbrook St., East Hartford 8, Conn.

*mark it best with
NOBLEWEST

LETTER from the PUBLISHER

The Man Who Reads

Not long ago I got into a discussion with a friend of mine at the Ford Motor Company about the problem of keeping up with new developments in manufacturing techniques. My friend started with Ford about 20 years ago in the foundry. At the time of our discussion he was one of the top five or six men in the Ford Manufacturing Engineering office on the staff of the vice president in charge of manufacturing. When you consider there are between 8000 and 10,000 manufacturing engineers at Ford, this is no mean achievement in 20 years.

He reads . . .

I asked my friend to what he attributed his success. His reply: "I have made it an unbreakable rule to read at least one business paper on the subject of manufacturing on a thorough and regular basis." He went on to say that he arrives at his office at 7:15 every morning, one hour and 45 minutes before starting time, and spends that time reading. He told me that he tries to read thoroughly every issue of AMERICAN MACHINIST/METALWORKING MANUFACTURING as well as two other publications in his field. "By doing this," he told me, "I am able to be better informed than the next man on the latest developments in metalworking technology and make better, more enlightened decisions."

An assurance . . .

You know men in your company like this man. You know others who never seem to find the time to read. It is almost axiomatic that the man who gets ahead is **the man who reads.** We have given you this assurance before; we repeat it now. If you will read every issue of *AM/MM* nothing important will happen in metalworking that you will not know about.

George Reppert

Announcing

A Major "Break-Through" In Cutting Fluid Performance

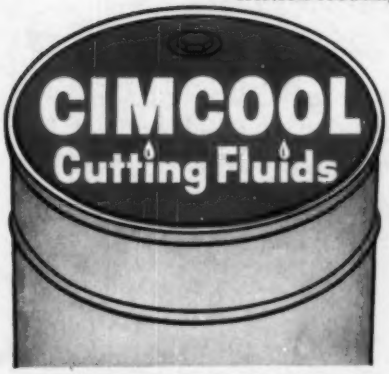
FIVE-STAR

★ ★ ★ ★ ★

CIMCOOL

From the Research Laboratories and Production Proving Grounds of Cincinnati Milling Comes This Remarkable New Product With These Proven Advantages:

1. **TROUBLE-FREE.** At lean, low-cost dilutions, Five-Star CIMCOOL goes into your machines and *stays put with no problems!* It lasts a long time and is extremely dependable.
2. **NO ODORS.** New bactericides keep Five-Star CIMCOOL in operation *four to six times* as long as other fluids.
3. **EXCEPTIONAL RUST PROTECTION.** Two different types of rust inhibitor in this *single-mix* concentrate provide up to 300% more rust control. This rust-control ability permits leaner dilutions, saves you money.
4. **CLEAN AND SAFE.** Five-Star CIMCOOL is just as clean as fresh, clear water to work in. It feels, smells and looks good. It will not smoke or catch fire. Good reasons why operators like it.
5. **LENGTHENS TOOL LIFE.** Production tests prove this new concentrate is second to none in providing *non-stop production*, because of its exclusive CIMCOOL EP, friction-reducing chemicals.



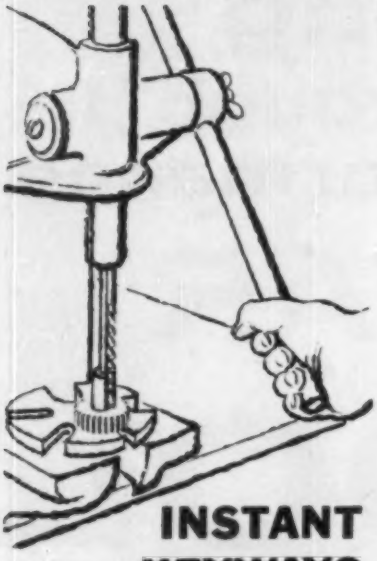
FOR 100% OF ALL METAL CUTTING JOBS

Production-Proved products of The Cincinnati Milling Machine Co.

FIVE-STAR CIMCOOL—Newest in the industry-proven line of CIMCOOL® Cutting Fluids.
CIMPERIAL® — Heavy duty replacement for cutting oils in those low-speed tough jobs.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Marks Reg. U.S. Pat. Off.



INSTANT KEYWAYS

A B C

With a Minute Man® Keyway Broach you can cut a keyway, by hand, in an arbor press *in one minute* for *as little as one cent.* Available individually or in kits complete with broaches, bushings, shims and keystock. For keyways from 1/16" to 1" in any bore 1/4" to 3".

SAVE TIME WITH THESE OTHER STANDARD STOCK BROACHES

Minute Man®

(A) SQUARE BROACHES
For finishing 1/8" to 1" square holes in one pass in cast or drilled bore. (32nd sizes, too)

(B) HEXAGON BROACHES
For finishing 1/8" to 3/4" hexagon holes in one pass in cast or drilled bore.

(C) ROUND BROACHES
For finishing 1/4" to 1" round holes in one pass in drilled bore.

The duMont Corp., Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

duMont

LETTERS

to the editors

330 W 42nd St, New York 36, NY

Finders Keepers?

Dear Sirs:
Re: "Wet" Car (*AM/MM*—Mar 6 '61, p97)

Sure, the 1923 Hudson was generally conceded to be a fine, durable car, but how was the cargo?

Ken Lloyd
Seattle, Wash

We never heard a word about any cargo in the car that was salvaged from the bottom of Lake St Clair. Possibly the bootleggers were on their way back for another load. Or possibly the salvagers decided they couldn't afford to pay today's Federal excise taxes on the stuff and threw it back (Hmm)—Ed.

Aluminum Soldering

Dear Sirs:
In a recent issue, you published some advance information in connection with aluminum soldering. Two manufacturers were mentioned: Chemalloy Electronics Corp, manufacturers of Chemalloy, and Metals for Industry, distributors of Tin-a-Lum.

We should be glad if you will be good enough to let us know the full postal address of these companies.

S Wilson
Canberra
Australia

Chemalloy Electronics Corp is located at Gillespie Airport, Santee, Calif, and Metals for Industry, Inc, is at 299 Pavonia Ave, Jersey City 2, N J—Ed.

Why do it the hard way?

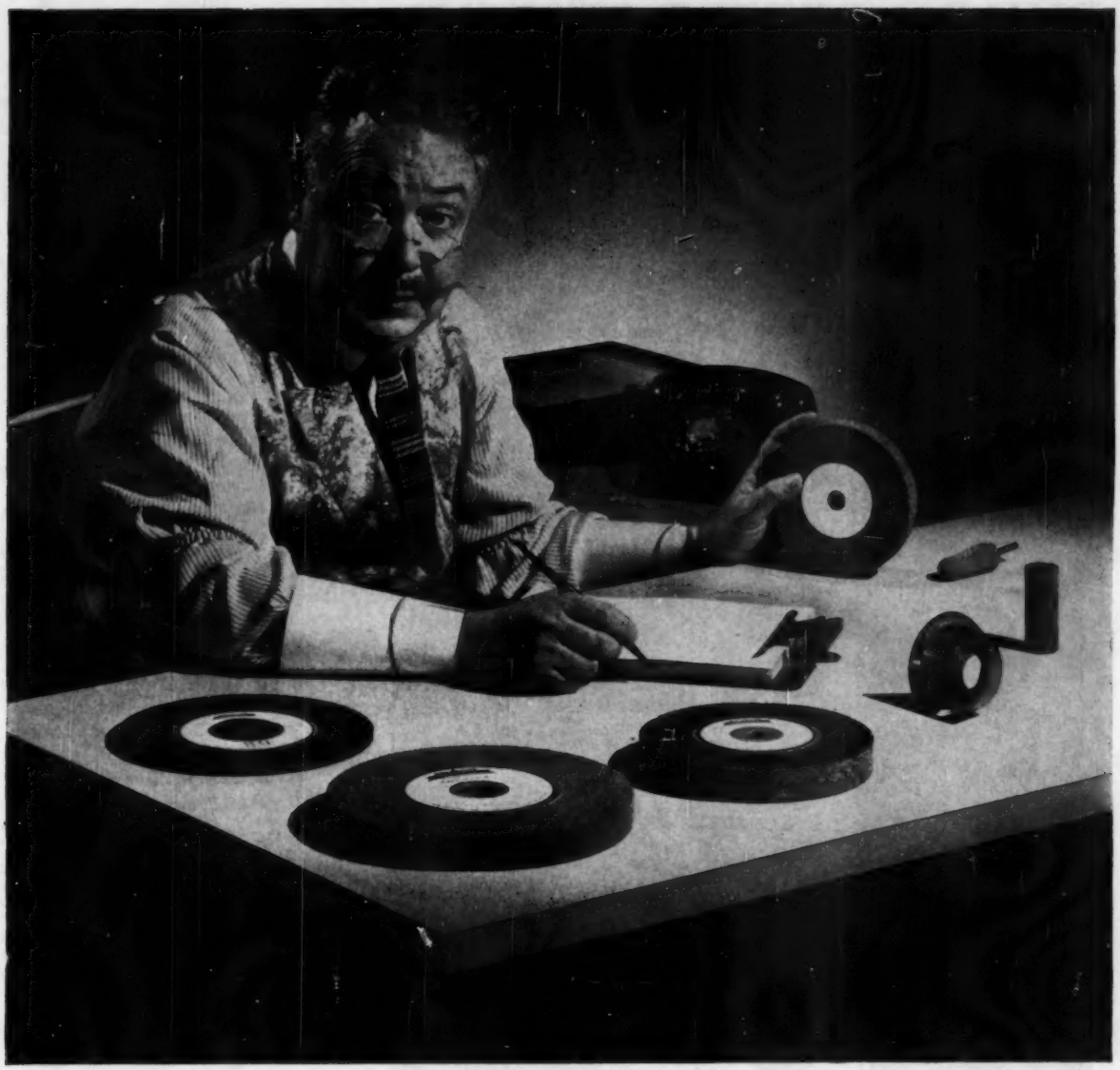
Dear Sirs:
This has reference to Edward P Boehnlein's article on "Maintaining progressive dies" (*AM/MM*—May 1 '61, p85). I particularly refer to that portion of his article titled, "Dismantling a die."

The handling of dies with the chain hoist and lead mallet, as we see it here at the Hansford Manufacturing Corp, is still in the horse-and-buggy stage. There is no real reason to use this method when so much time and thought have been given to the modern Die Handler.

We manufacure eight models

SHOPMATES

N. Jarvis



Why let long-established habit dictate your selection of grinding wheels?

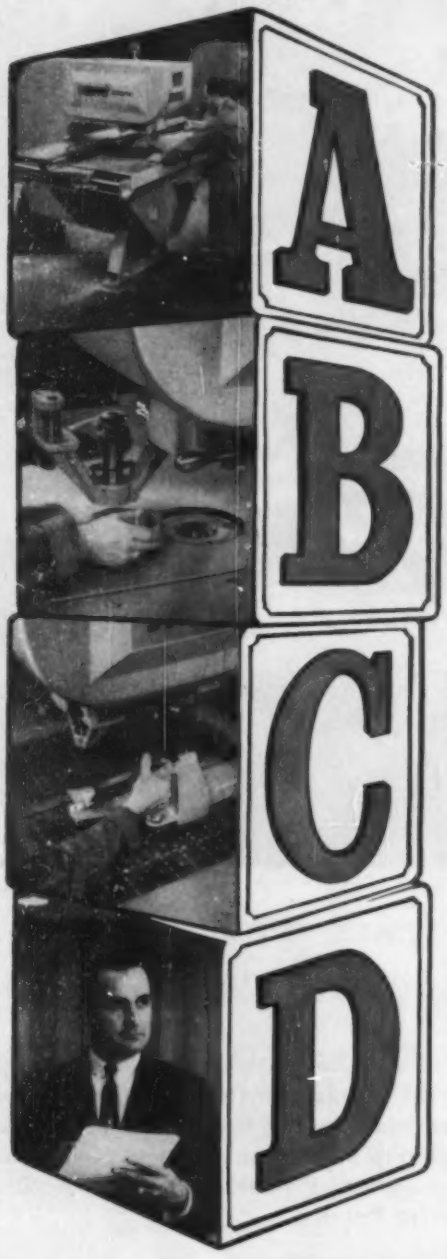
Sure, the grinding wheels you've always used may be doing the job, *BUT . . . is that job good enough* in today's cost squeeze? Let Simonds help *you* update *your* grinding practices. Complete line, available through Simonds distributors, includes wheels of all abrasives and bonds, all sizes and shapes . . . all industrially-renowned products, in efficiency-proved specifications . . . and backed by our 60 year reputation as a top-rank producer of abrasive grain and grinding wheels. Send for complete descriptive catalog.

SIMONDS ABRASIVE CO.

your "buy-words" for better grinding
CALL YOUR SIMONDS DISTRIBUTOR
helping YOUR business is HIS business

WEST COAST PLANT: EL MONTE, CALIF. — BRANCHES: CHICAGO • DETROIT • LOS ANGELES • PHILADELPHIA • PORTLAND, ORE. • SAN FRANCISCO
SHREVEPORT — IN CANADA: GRINDING WHEELS DIVISION, SIMONDS CANADA SAW CO., LTD., BROCKVILLE ONTARIO • ABRASIVE PLANT, ARVIDA, QUEBEC

BUILD A BETTER PRODUCT WITH STRIPPIT SUPER 30 FABRICATOR



A multi-purpose, single station sheet metalworking machine, the STRIPPIT Super 30 Fabricator punches round and shaped holes in workpieces up to 60″ wide... any length. Punches close-centered hole clusters in material to ¼″ thick . . . nibbles straight or contour lines in ⅛″ material ... notches 90° corners, radii and special edge notches in material up to ⅛″ thick.

Big savings in time are standard! STRIPPIT's Swing-Shift Punch Holders permit you to change punches from either right or left in *seconds*. STRIPPIT's Micrometric Back and End Gaging System permits rapid, precise positioning of workpieces. Set dimensions directly to thousandths

Convert STRIPPIT Super 30 Fabricator to an efficient medium run production unit simply by adding our Duplicator attachment. Another useful accessory is our Dupl-O-Scope, a high quality optical instrument designed specifically for translating blueprints, drawings, etc. into accurate templates or "one-of-a-kind" finished pieces.

Don't hesitate to call your STRIPPIT Tool & Methods Engineer. He can arrange a demonstration at your plant that will show you ways to cut costs with the STRIPPIT Super 30 Fabricator or other STRIPPIT machines and systems. Write for Catalog 30S.

WALES **STRIPPIT** INC.

200 Buell Road Akron, New York

In Canada. Strippit Tool & Machine Company, Brampton, Ontario, In Continental Europe: Raskin, S. A., Lausanne, Switzerland; In the British Isles· Kearney & Trecher—C V A. Ltd., Hove, Sussex England.

of this equipment, handling dies that range from 17 x 26 in. up to 36 x 80 in. and weighing from 400 to 6000 lb.

These handlers eliminate the possibility of injuring an expensive die, as pointed out by Mr Boehnlein, or of injuring the man who is attempting to lift the heavy weight with the chain pull.

V N Hansford, *president*
Hansford Manufacturing Corp
Rochester, N Y

More on Explosive Processes

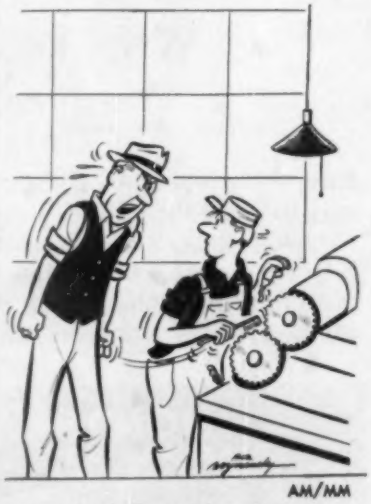
Dear Sirs:
We are very much interested in the high - energy - rate - forming, welding and other applications to the metalworking industry.

You reported on a high-energy-rate-forming seminar held in Philadelphia on March 29 and 30 (*AM/MM*—Apr 17 '61, p119), and we would like to obtain the program of the seminar and minutes of the proceedings if they are available.

Would you please let us know the name and address of the person in charge of distributing such information?

William Thompson
Chicago, Ill

The seminar was sponsored by the American Society of Tool & Manufacturing Engineers, and the society would be the best source for complete details of the meetings. The address is 10700 Puritan Ave, Detroit, Mich—Ed.



"Sure, I told you to clean the teeth on that gear, but. . . . !"

CALENDAR

Society of Automotive Engineers—Farm, Construction, and Industrial Machinery Meeting, Sept. 11-15, Milwaukee Auditorium, Milwaukee, Wis.

Instrument Society of America—Annual Meeting and Automation Exhibit, Sept. 11-15, Memorial Sports Arena, Los Angeles, Calif.

Pressed Metal Institute—Annual Meeting, Sept. 24-28, Grand Hotel, Point Clear, Ala.

American Welding Society—National Fall Meeting, Sept. 25-28, Adolphus Hotel, Dallas.

American Die Casting Institute—Annual Meeting, Sept. 27-28, Edgewater Beach Hotel, Chicago, Ill.

American Production & Inventory Control Society — National Technical Conference & Exhibit, Sept. 28-29, Pick-Congress Hotel, Chicago, Ill.

American Machine Tool Distributors Association—Annual Meeting, Oct. 4-6, Penn Sheraton, Hotel, Pittsburgh, Pa.

Society of Automotive Engineers—National Aeronautic Meeting and Display, Oct. 9-13, The Ambassador, Los Angeles, Calif.

American Standards Association — National Conference on Standards, Oct. 10-12, Rice Hotel, Houston, Texas.

Magnesium Association — Annual Convention, Oct. 16-18, Belmont Plaza Hotel, New York, N.Y.

National Safety Council—National Safety Congress, Oct. 16-20, Chicago, Ill.

American Institute of Mining, Metallurgical & Petroleum Engineers — Metallurgical Society Fall Meeting, Oct. 23-26, Pick-Fort Selby Hotel, Detroit, Mich.

American Society for Metals — National Metal Exposition and Congress, Oct. 23-27, Cobo Hall, Detroit, Mich.

Society for Nondestructive Testing—Annual Convention, Oct. 23-27, Henrose Hotel, Detroit, Mich.

MAJOR AIRCRAFT MANUFACTURER MAKES...

Fully Automatic Savings with NELCO TOOLS on Tape Controlled Miller!

PROFILE MILLING AROUND WING SECTION

OPERATION #1

MATERIAL	Aluminum Alloy, Tough & Abrasive.
CUTTER USED	2" diameter, 2 flute NELCO Carbide Tipped End Mill. Negative Helix.
SPEED	3600 R.P.M., 1900 S.F.M.
FEED	20" per minute.
WIDTH OF CUT	1½".
DEPTH OF CUT	3/16 to 1/8 inch.
PRODUCTION	Nelco End Mill conformed to aircraft tolerances and to rugged automated production schedule.

There are 121 Nelco End Mills specially engineered to mill Aluminum.

Machine: Giddings & Lewis, 2 spindle vertical, 100 H.P. each spindle, tape controlled

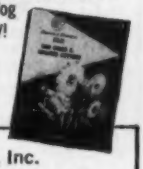
FACE MILLING WING SECTION

OPERATION #2

MATERIAL	Aluminum Alloy, Tough and Abrasive.
CUTTER USED	Standard 6" diameter Nelco Face Mill modified with 30° chamfer.
SPEED	3600 R.P.M., 5400 S.F.M.
FEED	80" per minute
WIDTH OF CUT	6"
DEPTH OF CUT	1/16 to 3/16 inch.
PRODUCTION	2 cubic feet of metal removed in 20 minutes. 6 pieces per grind—12 cubic feet of metal removed per grind.

Again, NELCO Carbide Tipped Tools prove their economy and dependability. NELCO manufactures the most complete line of Carbide Cutting Tools engineered to mill ALUMINUM. They are available through your Local Distributor.

Send for the NELCO Catalog today!



For that EXTRA Edge in Production!

NELCO

NELCO Tool Co., Inc.
Subsidiary of:
Cutting Tool Division
Brown & Sharpe Mfg. Co.
Providence 1, Rhode Island

9 questions you should ask about numerical machine tool controls

1

Has the system, through actual use, proven to be a money saver?

Many new controls on the market today have yet to be installed on their first customer application. However, Hughes numerical positioning controls have been successfully operating in customer plants for over a year and a half! One typical Hughes customer was able to cut tool costs by $3000 and reduce lead time by 50% on a run of 50 missile parts.

2

Is it competitively priced?

Many people are surprised that Hughes systems, with all their advantages, are often priced lower than competitive units.

3

How many machine axes can I control?

Hughes provides either two or three axis controls – in the same cabinet. And, with the Hughes system, you can purchase a two axis control now, and add the third later.

4

Are special skills required to prepare the tapes and operate the machine?

Not with the Hughes system. Anyone familiar with general machine shop practices can prepare the tapes and operate the machine after only two days training!

5

Can I get high accuracy — and, is that accuracy repeatable?

Hughes two-axis controls offer you repeatable accuracies of ±0.0002 inch with a resolution of ±0.001 inch. Adding the third axis, repeatable depth accuracies of ±.0005 with a resolution of 0.001 inch can be obtained.

6

Will I need a great deal of service after sale?

Maybe you've heard about numerical control systems that require a lot of service. Not so when you specify a Hughes Numerical Machine Tool Control. Customers report that "up time" is over 95% – after a full year of operation!

7

Is the system transistorized for maximum reliability?

The Hughes Transistorized System is much less sensitive to vibration, shock and temperature fluctuation. Result: with Hughes transistorized circuitry you get higher reliability and minimum maintenance.

8

Is the tape reader fast and reliable?

Mechanical tape readers have two inherent disadvantages: they are relatively slow and they tend to deform the tape holes. Not so with photo electric tape readers – the type used on Hughes controls. They're extremely fast (eliminating need for costly electronic storage) and they do not injure the program tape.

9

Does the manufacturer have a reputation for standing behind everything sold?

Hughes gets an emphatic "yes" to this question. Hughes has built a reputation as a *world leader* in advanced electronics and has a world wide service organization.

Find out more about how Hughes Numerical Controls

can increase your profits. Write, wire, teletype (TWX INGL 4117) or call direct: Hughes Industrial Control Systems, Dept. No. 92-21, P.O. Box 90904, Los Angeles 45, California. For export information please write: Hughes International, Culver City, California.

CREATING A NEW WORLD WITH ELECTRONICS

HUGHES

HUGHES AIRCRAFT COMPANY
INDUSTRIAL SYSTEMS DIVISION

SPOT NEWS...

- **A tool and die shop is being started in New Delhi (India)** as a joint venture of Harig Mfg Co (Chicago) and Malik (India) interests. To be known as Harig-Malik Mfg Co Private Ltd, the new 7500-sq-ft plant will be run by two Harig men, will employ and train about 25 Indians to make tools, dies, and special machines. Most of the machine tools for the plant have been shipped from this country.

- **Con-Vel Division of Dana Corp has received a three-year contract from Ford** Motor Company to produce a constant-speed universal for the front-wheel-drive Cardinal, which is scheduled for introduction next year.

- **IBM computer service centers will provide Autopromt programming** for small shops not equipped with computers, or train people at companies having computers how to use this new numerical-control system. See page 76 for full details on this new system for preparation of 3-D continuous-path tapes.

- **Capital spending will rise to an annual rate of $35.5 billion** by the fourth quarter and will total $34.46 billion for the year as a whole, according to the latest SEC-Commerce Department survey. This supports the findings of the recent McGraw-Hill survey: Capital spending is touching bottom now but will be moving up from the third quarter on.

- **Standards for numerical control of machine tools and for process control** computers have been requested of the American Standards Association. Spearheaded by the Electronic Industries Assn, and including ASME, AIEE, IRE, and the Aerospace Industries Assn, 12 organizations have asked for standard codes for feeding data to machine tools, for standards of measurement and description of characteristics of media such as punched cards or tape, and for a variety of standards covering other data-processing functions.

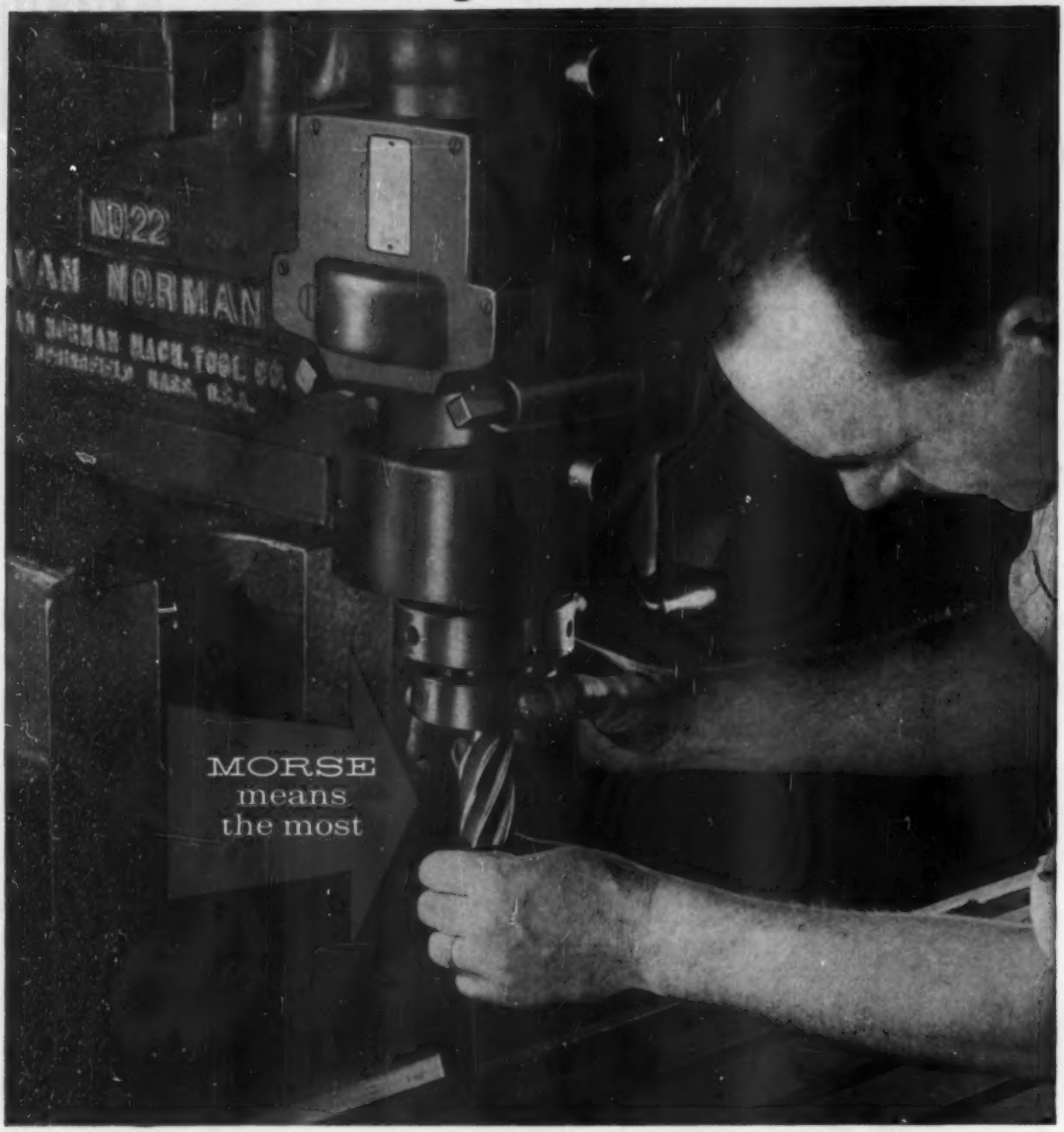
- **Production of Rambler autos in Argentina will begin early next year** as a joint venture of Willys Motors, its affiliate, Industrias Kaiser Argentina, and American Motors Corp. The proposal provides for licensing of I K A to produce the Rambler line at its ultra-modern plant at Cordoba. The agreement is subject to approval by the Argentine government.

- **Navy Department has contracted with Bryant Chucking Grinder Co** to purchase more than half of the 45 Bryant Centalign internal grinders that could not be shipped to Russia because the export license was revoked. These machines will become part of the Navy's mobilization reserves, it is understood. Bryant preferred to retain a number of the machines for disposal through commercial channels. Some already have been sold, according to Bryant.

- **Temperatures of 3000 to 6000 F for metallurgical processes** can be developed by a "marriage" of chemical and electrical energies just announced by Arthur D Little (Cambridge, Mass). Called the Combex-ADL burner, this unit boosts the energy from ordinary combustion of a fuel-oxidant mixture by superimposing on the flame electrical energy from a low-current, high-voltage AC discharge. Unit is applicable to cutting, welding, scarfing.

- **Ultrasonic vibration of a cutting tool can increase tool life** as much as four times under proper conditions, say Russian experimenters. Using a HSS single-point tools on a lathe, they found that low-intensity radial vibrations (about 10 microns) boost tool life, but that higher intensities can reduce tool life.

with men who know cutting tools...it's MORSE everytime



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331

WASHINGTON...

Tax revision plans . . .

The tax credit scheme proposed by the administration as part of its big tax revision program isn't going to be approved by the House Ways and Means Committee. That's the guessing as the committee wound up 5 weeks of hearings.

Committee members had indicated earlier there was little chance for the complicated scheme devised by Assistant Treasury Secretary Stanley S Surrey. He proposed to allow up to a 30% cut in a company's tax bill, depending on the ratio of its spending for new plant and equipment to its depreciation allowances. The top credit proposed was 15% of the amount by which purchases exceed the same year's depreciation allowances; 6% credit for spending over 50% of depreciation allowances; and—for small firms—10% of any spending up to $5000.

Treasury officials have tossed in the towel on this, but have suggested they'd go along with a 7% across-the-board credit, without regard to depreciation. This idea was suggested by several non-government witnesses as preferable to the administration's complicated plan.

Treasury officials say, however, that plans suggested to liberalize depreciation allowances—the method preferred by most witnesses and probably most members of the Committee—wouldn't be accepted. Reason: they cost too much in lost revenues.

The outlook is dim, too, for the administration's proposals to tax earnings of foreign subsidiaries of U S companies before the earnings are repatriated. Odds favor an attempt to cut back on use of tax havens to avoid taxation altogether.

The chances for passage by Congress of a tax bill this session seem dim. The Senate Finance Committee is holding off hearings until the House Committee acts. This just about guarantees the bill being held over until next year.

New defense buying scheme . . .

The Defense Department has set up a new procurement system known as "two-step formal advertising." It combines the benefits of negotiated contracting and open advertised bidding for purchase of equipment where precise design is not as important as specific performance characteristics.

In the first step, bidders are invited to submit designs to meet specified performance criteria. No price or cost estimate is sought at this stage. The contracting agency then examines the designs, approving those which "would appear to provide an item with desired performance."

In the next step, bidders with approved designs submit sealed bids on their proposals. The contract then goes to the lowest bidder.

In the past two years, the Air Force has used the new procedure experimentally to buy some $70-million worth of equipment, mostly electronic gear. Now the Pentagon has approved the procedure for general contracting use by all military contracting agencies.

Drive for more competition . . .

The new procurement system is part of the Kennedy administration's push for greater competition on defense orders and for curbs on excessive costs. Defense Secretary McNamara is concerned about GAO charges of limited competition—particularly sole-source suppliers—and ineffectual audits of contractor price estimates.

Defense officials are striving to step up the volume of open advertised bidding on contracts, which many Congressmen plump for as a means to expand competition. But these officials say formal bidding is "too artificial and rigid" to provide a complete remedy; they feel more competitive buying is possible even under negotiated procurement.

They plan to bring more potential suppliers into contention for new contracts by defining requirements and releasing funds well in advance of actual contract negotiations, and by preparing the necessary technical data and specifications as early as possible.

Defense contract analysis . . .

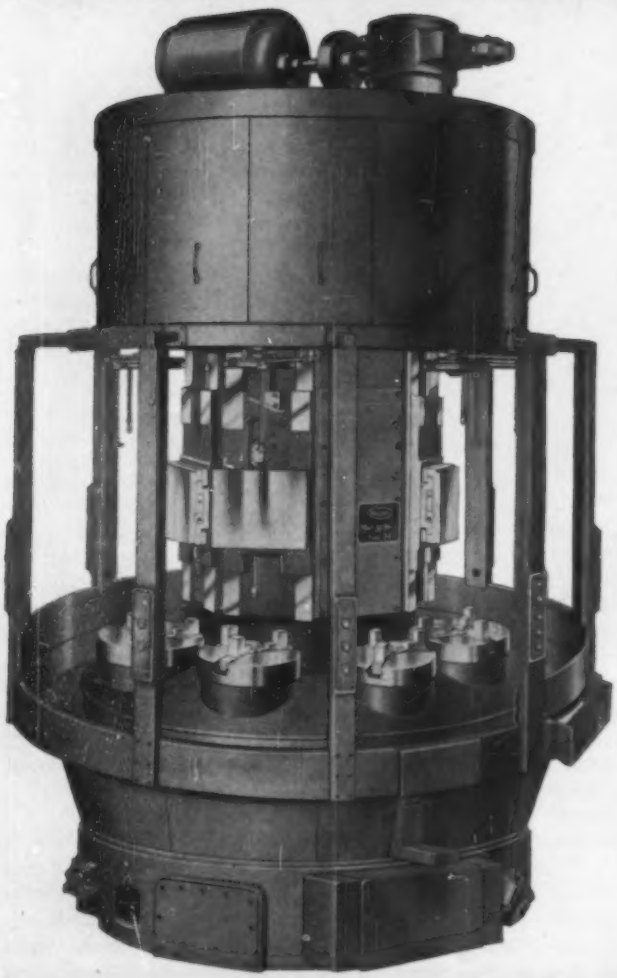
An analysis of the $11.2-billion worth of defense orders placed during July-December 1960 shows that about 60% of the contracting was "noncompetitive"—25% stemming from "single-source solicitations," and 35% representing "follow-on" or second production-run contracts.

About 40% of the contracting was described as competitive. Only 13% was placed through formal advertising. About 6% was placed through "technical and design competition" and 21% through "informal price competition," that is, small business set-asides, small-lot purchases, and the like.

Retraining displaced workers . . .

The Kennedy administration, facing hard-core unemployment of several million persons whose job prospects are almost gone, is drafting a plan to relocate, train, and find employment for those who have been displaced by automation or left behind in the job market. Metalworking skills figure prominently in retraining plans.

NOW BULLARD PRICED LOWER!



NEW Bullard Mult-Au-Matic Type "M"

Contrary to the general upward trend in the cost of new plant production equipment, The Bullard Company is offering the *new* Type "M" Mult-Au-Matic at a price which is *lower than competitive methods.*

Designed and built according to exacting Bullard standards, the *new* Type "M" Mult-Au-Matic incorporates many new features of rigidity, accuracy and productivity which have made this machine famous the world over.

For complete information on the *new* Bullard Type "M" Mult-Au-Matic, call your nearest Bullard Sales Office or Distributor or write to

The Bullard Company, Bridgeport 9, Conn.

DETROIT...

Truck output up . . .

New truck production, considered by many observers to be a keener reflection of the state of the nation's general economic well-being than the production of passenger cars, is paced during June at a figure 8% above the 103,000 units that rolled of the lines in May.

If the industry's savants are correct, about 1,100,000 trucks will be built in 1961. This is about 100,000 fewer units than last year, but a greater variety of models has been available. Both Ford and Chevrolet introduced compact vans and pickups this year. These have been selling strongly, evidenced by the fact that the Econoline series grabbed 17% of Ford's January-May truck sales total.

Chevrolet is planning to enter the diesel truck field late this year or next. Detroit Diesel engines will be available as an option in heavy-duty models. Now, for the first time, Ford, Dodge, and Chevrolet will be active in the diesel market simultaneously, a market traditionally dominated by independent manufacturers.

Mack Truck, which, incidentally, is building a new 1-million-sq-ft plant in Maryland, is hiking production by 30% for its heavy duty models this month. White Motor reports that it is hard pressed to keep up with orders for over-the-road tractors and construction trucks. Diamond T orders are backlogged as well.

Studebaker, Reo and Continental Motors have received contracts totaling more than $55 million for military trucks. International's new Scout model requires two nine-hour production shifts to keep up with demand.

Passenger cars too . . .

Burgeoning truck sales are following close on the heels of a month of solid passenger car sales. Ford Motor Company sold 177,840 cars and trucks during May, the highest total for that month since 1925.

Chevrolet reported May retail sales that were second highest for May in the company's history. Corvair, which made up 21% of total Chevrolet sales in May, claimed that the more than 35,000 units retailed represented the highest single monthly total since the car was introduced 19 months ago.

Studebaker-Packard sales peaked for the year so far in May. Studebaker-Packard also announced that Mercedes-Benz sales figures for May were the highest for any month since the company began distributing Mercedes-Benz cars in the United States. Volkswagen was the only other import to show a gain.

New role for compacts . . .

In spite of the steady gains reported monthly by Volkswagen, and the sudden surge of Mercedes-Benz, American automakers have forgotten the import scare of a couple of years ago. And in the opinion of at least one European close to the automotive scene in the U S, the tide may soon turn in the other direction. His opinion is shared by the product planning chief of one of the Big Three.

Louis F. Argentin, the Budd Co's deputy director for Latin Europe, points out that the determinant of car weight in Europe is the high cost of gasoline. Europeans, too, he says, prefer luxury rides to the jarring that sports car buffs are willing to take in the name of sport and fashion. If the price of gasoline was reduced sufficiently, he asserts, European cars would become larger and heavier—to just about the size of present American compacts. And this is exactly what Argentin expects to see

The enormous reserves of the Sahara oil field will be channeled into the south of France to new refineries serving both the inner and outer areas of the Common Market within five years. Argentin believes that the cost of gasoline in Europe will be substantially reduced, and the market picture for larger, more powerful cars will change. American automakers have the cars that Europeans will soon want.

The impact of compacts on American exports is already being felt. Of the more than 44,000 U S cars exported to countries other than Canada so far this year, 43% were compact models.

American toolmakers can take heart in a changing European market, according to Argentin. A case in point: The Budd Company's role in building all tooling and transfer equipment for the new Citroen plant at Rennes, in western France. The new Citroen will be built with 100% American tooling.

When Citroen decided to build an all new car, the Budd Company convinced the automaker that tooling could be delivered to the new factory in half the time that the job could be completed in Europe. Says Argentin, Any U S company that can guarantee double speed and top quality can get European business, even though the same work performed by Europeans would be done at considerably less cost.

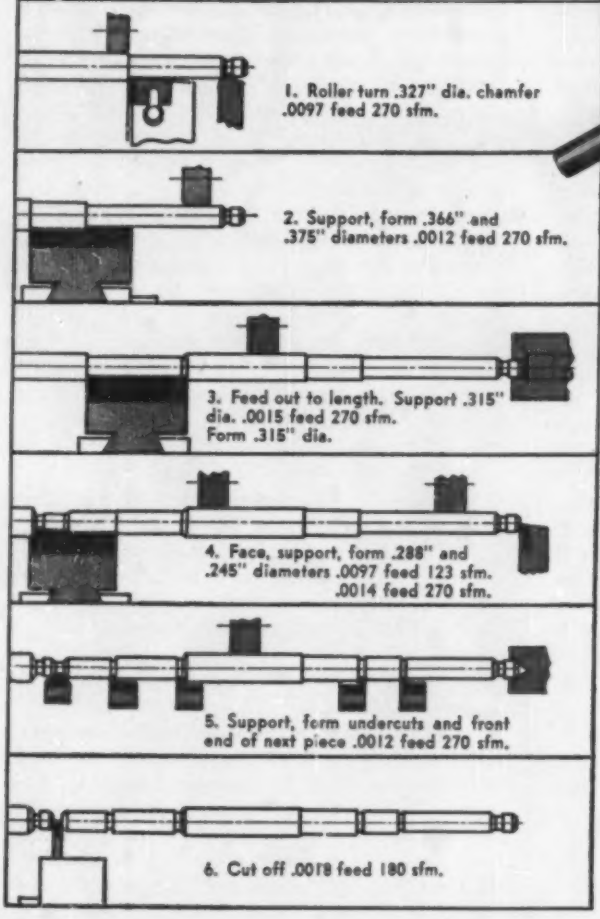
Machine tools for Down Under . . .

Several machine tool builders have received requests to bid on about $12 million worth of machine tools for Holden's (GM subsidiary in Melbourne, Australia) new engine. See p57.

GREENLEE AIR-FEED AUTOMATICS BENEFIT "ELECTROLUX" FOUR WAYS . . .

MACHINE . . . 1"-6 Automatic Bar Machine Air-Feed — Feedout on index and in 3rd position during machine cycle.
TOOLING . . . Carbide Tipped
MATERIAL . . . 1137
STOCK SIZE . . . 13/32" rd.

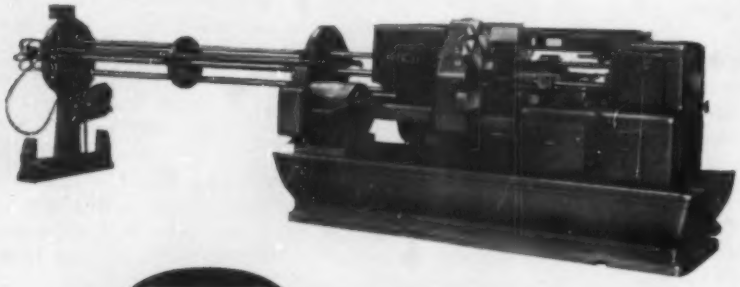
TOOL SLIDE STROKE . . 1-9/16" at .0097" feed.
SPINDLE SPEED . . . 2540 rpm 270 sfm.
MACHINE TIME . . . 5.8 seconds.
ESTIMATED GROSS PRODUCTION . . . 620 per hour


1. Roller turn .327" dia. chamfer .0097 feed 270 sfm.
2. Support, form .366" and .375" diameters .0012 feed 270 sfm.
3. Feed out to length. Support .315" dia. .0015 feed 270 sfm. Form .315" dia.
4. Face, support, form .288" and .245" diameters .0097 feed 123 sfm. .0014 feed 270 sfm.
5. Support, form undercuts and front end of next piece .0012 feed 270 sfm.
6. Cut off .0018 feed 180 sfm.

1. Eliminate stock pushers . . .
2. Eliminate scoring of stock . . .
3. Reduce downtime during set-up . . .
4. Provide extra length feed-out . . .

The part is a 6-7/8" long armature shaft used in the "Electrolux" vacuum cleaner. It demonstrates how effectively Greenlee Air-Feed Automatics and carbide tooling can team-up to increase production and reduce costs. The shaft is machined from 13/32" S.A.E. 1137 steel at a gross production rate of 620 pieces per hour. Recommended cutting speed for high speed tooling is 120 sfm. The rate was boosted to 270 sfm with carbide-tipped tooling. Sequence of operations is shown at the left.

Note how the stock is partially fed out on the index and to its full length in the third position. This provides for the most effective tooling arrangement. Greenlee Air-Feed Automatics permit greater job versatility and assure added profits. See your Greenlee representative or send us a print of your high-cost problem-part.



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PRODUCTION MACHINERY
GREENLEE BROS. & CO.
SINCE 1863
1975 MASON AVENUE
ROCKFORD, ILLINOIS

COMMERCIAL CASTINGS
TRANSFER MACHINES • SPECIAL MACHINES • AUTOMATIC BAR MACHINES • WOODWORKING MACHINES AND TOOLS • DIE CASTING MACHINES • TRIM PRESSES • HYDRAULIC AND HAND TOOLS

AIRCRAFT and MISSILES...

More bombers to be built . . .

Congress has given final approval to a measure permitting the Pentagon to spend as much as $12.6 billion for new planes, missiles and naval vessels in the fiscal year beginning July 1.

Included in this authorization bill is $525 million for manned-bomber production. This item was opposed by the Kennedy administration. In recommending against continued B-52 production, Defense Secretary McNamara envisioned as an alternative a heavy manned-bomber that "might be thought of as a mobile launching platform for missiles . . . that could be maintained in the air for long periods of time and which, therefore, did not run the risk of being destroyed on the ground . . ."

Although the bill does not specify what type of bomber the money will be used for, the only long-range aircraft currently available are the Boeing B-52 and the Convair B-58.

In addition to the money for bombers, the bill includes authorizations of $21.2 million for turbofan engines for 15 KC-135 transports, $8 million for one executive-type jet, and $80 million to begin work on a nuclear-powered missile-firing naval frigate, in addition to seven conventionally powered frigates.

Missile base strikes . . .

Washington has set up a plan to curb work stoppages at ICBM bases under construction. It centers on a no-strike, no-lockout pledge from the major building trades and industrial unions and the manufacturing and construction contractors engaged in site activation work.

An 11-man arbitration commission has been set up to handle labor disputes. It will, in turn, create local labor-management committees at local base sites. When a local committee is unable to resolve a dispute, the national commission will take over the case.

Meanwhile, a Labor Department Advisory Committee is working up more precise criteria for determining the types of installation work at missile sites which should be classified as construction. A major issue in the labor problems hampering missile base construction has been jurisdictional disputes between metalworking and electronic technicians belonging to industrial unions such as IAM, UAW, and the building trades workers. Each side has claimed the right to install missile guidance consoles, propellant fueling lines, and similar equipment.

Army picks two 'copter designs . . .

The Army has picked Bell Helicopter's D-250 design and Hiller Aircraft's model 1100 in design competition for a new light observation helicopter. Seven prototypes of each design will be built in about 15 months. One production design will then be approved for large-scale output.

This decision represents a new approach for the Army. Up to now, the Army has usually picked only one source for new equipment prototypes. Air Force and Navy, on the other hand, frequently make two source selections for prototype testing, then eliminate one model for production. Nineteen design proposals were submitted for the new project.

The new helicopter will be a lightweight, single-rotor, four-place machine powered by GM-Allison's T-63 gas-turbine engine. It is designed to carry a 400-lb payload at a speed of 110 knots. Unit production cost is estimated at roughly $35,000. The production run is tentatively planned to total about 3500 planes, with deliveries expected during 1965-70.

Streamlined management program

A new streamlined scientific management program to enable the Air Force Logistics Command and industry to control the development of over 100 Air Force weapons systems was described at the recent joint meeting of the Institute of the Aerospace Sciences and the American Rocket Society.

Called WSPACS Study (Weapons Systems Programming and Control System), the program was set up by the Air Force and consists of operations research teams from six major aircraft companies. They conducted research studies of scientific management techniques for decision-making through use of computers and are testing these new techniques prior to large-scale use.

R&D gains 17-fold in 10 years . . .

An indication of how important research and development has become in the aerospace field is contained in these figures from the Aerospace Industries Association: In 1950, Department of Defense expenditures for R&D totaled $245 million; in 1960, they reached a massive $4.2 billion. **Unfortunately for the aerospace companies,** R&D work has become a prime source of business. Unfortunate, for it is a type of business that usually results in decreased income.

Check and Double Check — BETTER GEARS

This Helical Lead Measuring Instrument* checks and records within .0001" the helix angle on helical gears to assure that the position of the tooth bearing meets the print specifications.

This machine utilizes the optical principle of machine setting (A) to measure accurately any angular deviations observed visually (B) and permanently recorded (C).

This is one of many details of gear manufacture and inspection that has won for DOUBLE DIAMOND gears their reputation as gears thoroughly qualified for top performance in any application for which you buy them.

Our sales representatives are engineers and gear designers — ready to tackle a gear assignment at any stage of its development. When may one call on you?

Just write or phone.

**This model was introduced at the 1960 Machine Tool Exposition in Chicago.*

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

MACHINE TOOLS...

Armed services order tools . . .

Final June figures on net new machine tool orders will reflect sizable purchases by the armed services before the end of the 1961 fiscal year.

Douglas Aircraft, for one, is reported to have placed 11 big machines with a midwest builder and two others with another company. All 13 machines are to be numerically controlled.

About $15 million will have been spent by the Air Force for industrial equipment in the April-June quarter. Around 60 to 70% of that amount will be for machine tools. For the entire fiscal year 1961 (closing June 30) $25 to $30 million will be committed for industrial equipment.

During fiscal 1962 expenditures for machine tools are expected to be substantially higher than in the past year.

Air Force's retrofit program whereby 45 to 60 machine tools will be equipped with new numerical-control systems will get under way in August. The financing will come out of the 1961 budget.

Further orders for machines for the Chevrolet six-cylinder engine program will help swell June orders for cutting-type machine tools. Chevrolet is estimated to be putting $20 million into this program.

Licenses likely to be granted . . .

Despite protests of Representative Lipscombe of California that virtually all US machine tools that the Russians want should be declared off-bounds, chances appear good that licenses soon will be granted for shipment of US tools to Russia.

Moreover, these licenses will not be revoked later on as was the license for Bryant machines. About half a dozen American builders have license applications pending, it is believed. Most of them are concerned with auto truck tooling programs.

Defense Department has been the object of attack by Lipscombe, who charges that it now favors export licenses for specific machines to which it previously had objected.

As long as the machines to be shipped are on the Permissible List, the criterion from this point on seems to be: Are similar machines available from other countries without too much disparity in delivery dates? If they are, there is no good reason for withholding a license.

Japanese are heavy buyers . . .

Import applications for machine tools totaling $214 million were filed with Japanese government in the March-May period. The reason for such heavy demand for foreign tools by Japanese buyers is the inability of the hard-pushed native machine tool builders to meet delivery requirements.

Up to now most of the imports have come from West Germany and the United States. But a 20-man purchasing mission, headed by Mitsui Precision Instruments' Shuzo Yamato, is in France to buy $10 million of machine tools from eight firms in the Schneider group.

New engine for Australia . . .

General Motors is asking for bids on a new six-cylinder engine for its Holden car in Australia. Around $12 million probably will be spent for this program, with orders likely to be placed in August by General Motors Overseas Division in Detroit.

Auto retooling this year has leaned heavily toward rebuilt machines. Only Ford and Chevrolet have really major programs. Chrysler has none. Chevrolet is installing much rebuilt equipment at Tonawanda to produce its forthcoming four-cylinder and six-cylinder cast-iron engines on a single production line. The new six is for a car smaller than the standard Chevrolet. Later on, when and if demand develops, an even smaller four-cylinder engine of the same basic design as the six-cylinder engine, will be used in a compact car.

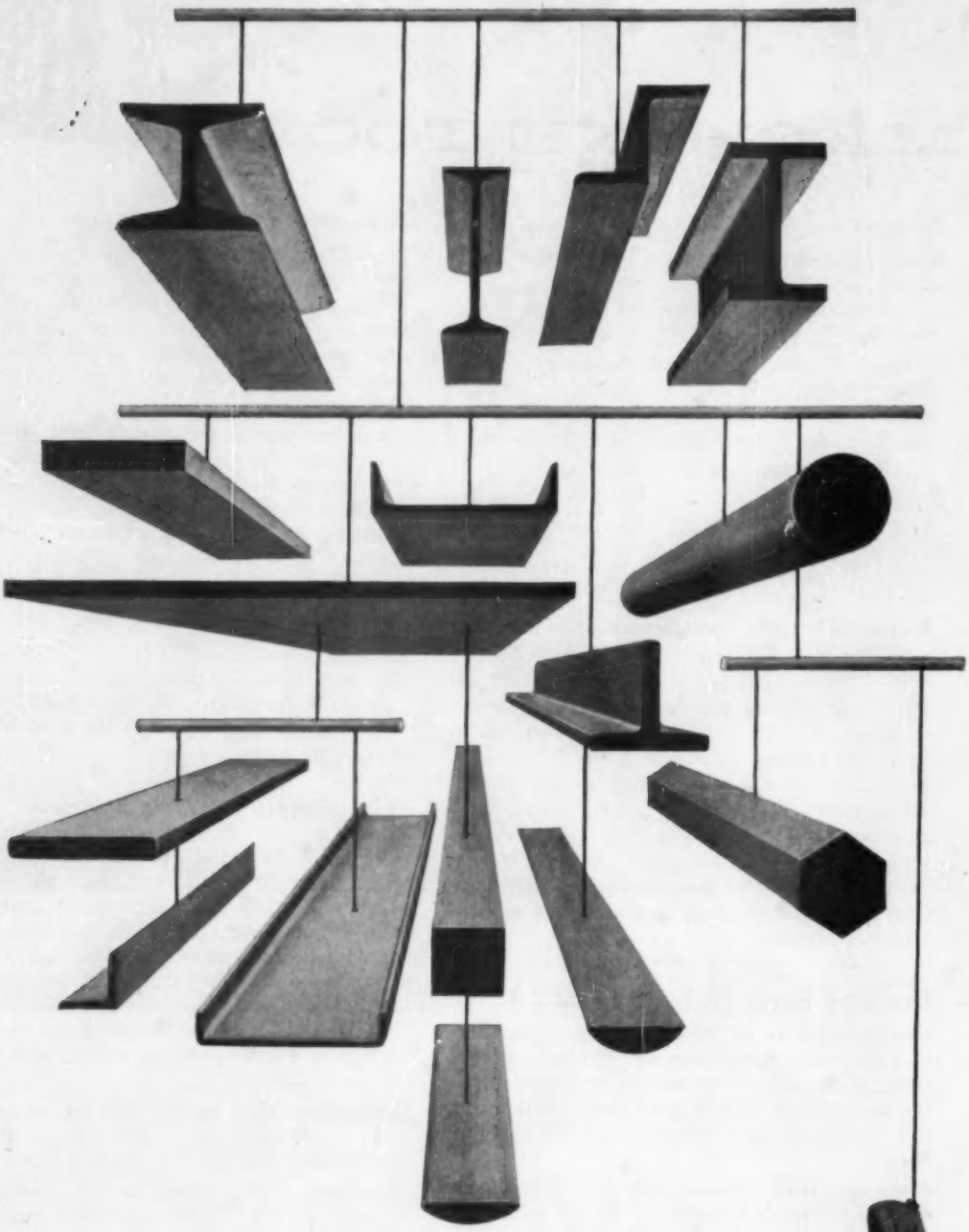
Rebuilt machines for the same engine are going into Chevrolet's Flint, Mich, plant and into Chevrolet's McKinnon plant in Canada.

Chevrolet is rebuilding its older six-cylinder engine line at Flint. The equipment for the four- and six-cylinder engines will replace existing V-8 production facilities in that plant only.

General Motors is reported rebuilding a transmission line in its Windsor, Ont, plant for automatic transmission manufacture.

Cadillac is planning a new V-8 engine. It will be made on the existing V-8 engine line in Detroit, where some rebuilt machines as well as new ones will be installed.

BF



Call any one of 20 Ryerson service centers for bars, shapes, structurals and plates. No one comes close to equaling Ryerson stocks of hot rolled carbon steels in shapes, sizes and tons. And no one equals Ryerson quality controls and cutting accuracy. So be Metalogical—call Ryerson.

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JOSEPH T. RYERSON & SON, INC., MEMBER OF THE INLAND STEEL FAMILY

METALOGICS

PLUS VALUES IN STEEL • ALUMINUM • PLASTICS • MACHINERY

MATERIALS...

Degassing process improved . . .

Aircraft-quality alloy steels treated by Chicago's A Finkl and Sons Co's degassing process are said to be better as a result of two process improvements. The batch process degasses the steel in the ladle (*AM*—Aug 24 '59 p87). One refinement is a method of pouring vacuum degassed steel through a blanket of argon gas and into ingot molds filled with argon. Argon is supplied through a 15-in.-dia collar surrounding the pouring outlet in the ladle's bottom. Thus oxygen is prevented from reaching the molten metal after it has been degassed.

The other improvement consists of a large airtight hopper installed inside the top of the vacuum degassing chamber. Thus limestone, aluminum, and other additives placed in the hopper can be released into the alloy during the process.

Two-year record at a large automotive forging shop shows 24.7% more hot-work forgings per sinking in each set of FX nickel-chromium-molybdenum vacuum-degassed steel dieblocks than from dieblocks made with non-degassed steel.

Bronze the rod . . .

In combination with hardened steel bushings, a new rod material called Bronze Case offers an interesting twist on tradition. Patented by Thomson Industries, Inc, Manhasset, NY, we wonder why it wasn't thought of sooner. High quality bearing bronze is fused on the surface of a steel rod which is subsequently ground and straightened.

Thus, with the bronze on the large area of the shaft instead of confined to the bearing area within the bushing, wear rate is substantially reduced. The rods are rustproof, nickproof, and are said to store an "enormous" amount of lubricant. Rods of AISI 1060 steel, heat treated to 213,000 psi, are available in standard diameters from ¾ in. to 3 in.

Plastics outlook bubbling . . .

Quoting McGraw-Hill's forecast of prospects for growth, Dr Hugh L Dryden, deputy director of the National Aeronautics and Space Administration said, "The future for plastic materials is exceedingly bright. Output should approach 25 billion pounds in 1975, compared with nearly 6.5 billion pounds in 1960." (1 billion pounds equals 500,000 tons.) He hailed the role of Plastics in the Space Age at the opening ceremonies for the Society of the Plastics Industry's 9th National Plastics Exposition at New York City's Coliseum.

There was little doubt that the plastics industry is still on the rise, as one watched the crowds teem through the three floors of exhibitions. Similarly, it was clear that for some metals and metal products, plastics will offer a serious challenge. On the other hand, the industry seems to offer a substantial market for heavy metal machinery to form the plastic products.

Moving in on metals . . .

Glass-fiber-reinforced plastic auto bodies are the key to profitable production of low-volume cars, according to Robert S Morrison, president of Molded Fiber Glass Body Co. He said, "Today the level up to which fiber glass plastic car bodies have a cost advantage over steel can run as high as 40,000 units. This level is up from 15,000 in 1954, when we went into production on the first Corvette bodies."

"Though the material is more expensive than steel," he explained, "production molds for reinforced plastics cost only one-fifth as much as metal stamping dies." Low mold costs permit profitable low-volume production and minimize the expense of model changes. Mr Morrison expects the use of fiber-glass-reinforced plastic in transportation to increase 11% in 1961.

"Metal-replacement" plastics such as Dupont Delrin and Zytel, General Electric's Lexan, and Celanese Corp's Celcon, were prominent at the show. This year's Bachnew Award for plastic design went to Chrysler Corp for using Delrin in place of zinc die castings in the instrument cluster of its 1961 Valiant.

A Zytel master cylinder for the brake system in Willys do Brasil vehicle was shown. Molded by Jamil Ashcar and Cia, Ltda, the Zytel is said to offer strength, resiliency, and low coefficient of friction plus resistance to lubricants and solvents. Other metal replacements included a meat-grinder screw of Zytel nylon resin molded over a steel insert and an umbrella with inner ribs molded of Delrin.

Composite materials . . .

Combined use of metals and plastics holds considerable promise. Foam filled metal panels are renewing competition with wood cabinetry. Monsanto Chemical Co showed a minute container with wall 1/32-in. thick but so strong a man can stand on it. An Alcoa spokesman described a new laminate of aluminum sheet and vinyl film for building panels and insulated siding, aluminum castings finished with fluidized plastics for toilet bowls and sinks, and plastic-lined aluminum bottle caps.

free analysis of your tape requirements

point-to-point or continuous path positioning

dial-in control of 2 axes, or tape control of 2, 3, or 4 axes

tape control of all speeds, feeds, depth, and clamping

exclusive Di-Matric controls provide infinite machining cycles

tape-revolved tables with infinite positions or radial feeding

automatic power tool lock with hardened and ground taper

automatic tape controlled tool changers available

all drive screws in center of guideways for best accuracy, least wear

tape is read during positioning; no delays

simple switching from tape to pendant controls

heavy-duty, rigid structural design

repeatability within plus or minus .0001"

wide range of sizes, both table or floor type

14 reasons to consider tape-controlled Gilberts

Summarized here are the main reasons you should consider Cincinnati Gilbert's numerically-controlled 4" and 5" horizontal boring mills. We suggest a letter or phone call for complete information—or, better yet, a visit to the plant to see an actual demonstration. The Cincinnati Gilbert Machine Tool Co., 3366 Beekman Street, phone KIrby 1-4815, Cincinnati 23, Ohio.

GILBERT

WHAT'S AHEAD... in Metalworking

TRENDS

Upturn continues but rate slackens . . .

The metalworking production picture continues good though the pace of the recovery seems to be slowing down somewhat. The *AM/MM* Production Index for June is estimated at 102 (1957 = 100), up one point from May.

Steel producers report a leveling off in the rate of upturn but the fact remains that this upturn is probably going to turn out better than had been expected. One major firm says incoming July orders are lower than any month for the last three or four, but the decline is attributed largely to vacation shutdowns throughout industry in July and August.

Aircraft parts producers say that business is going along about as forecast. Most companies anticipate that 1961 business will drop below last year, attributing this to the continuing decline in the aircraft industry since 1957. One producer says that reinstatement of the off-again, on-again, off-again B-70 bomber could mean a real increase in production and sales, but feels that there is nothing decisive enough on this as yet.

Bearing manufacturers have been reporting some improvements in production schedules, though most companies do not expect 1961 volume to exceed that of last year. The slow, steady improvement predicted at the beginning of the year is proving out for most companies.

Sheetmetal shops seem to be holding their own, and, in a few cases, they are ahead of last year. Predictions are for a spotty third quarter because of the usual summer shutdowns. Consensus is for a good-to-excellent fourth quarter this year.

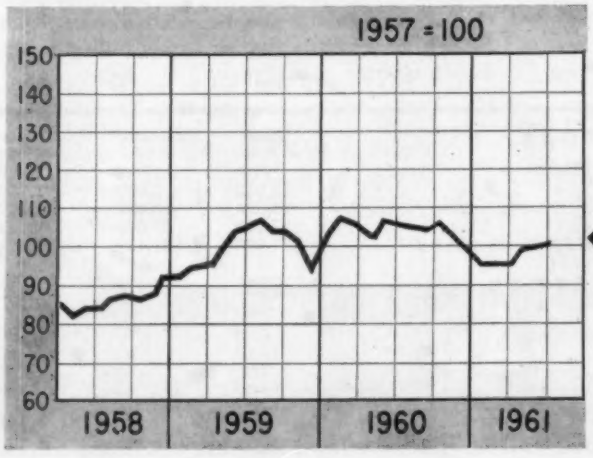
Prospects for electrical machinery builders appear good although the major manufacturers are not too talkative. These companies give out statements to the effect that they see expanding markets and bright prospects, but they are reluctant to pinpoint these areas. The outlook is for 1961 business to be slightly better than in 1960.

Commercial heat treaters report a leveling off in the pickup they experienced about a month ago. Volume so far this year is about on par with last year's and most shops will settle for results matching last year's.

Radio and TV manufacturers are experiencing sales considerably ahead of a year ago, with one company spotting the upturn at better than 10%. Each week shows an increase over the previous week and the industry now expects sales of radio and TV sets this year to hit 6.1 to 6.3 million, against an earlier projection of 5.7 to 5.8 million, which would have been roughly the same as 1960.

Business in many plating shops appears to be very slow, with several shops down 15 to 25% compared to the same period last year. Most of these shops service the automotive industry; one reports no gear plating business, another reports no brass plating business.

Orders for industrial material handling equipment dropped 20% from bookings reported the previous month. The MHI index fell to 109.85 (1954=100). A drop had been anticipated, but not a drop of this magnitude. The outlook, however, is for an upward trend for the year.

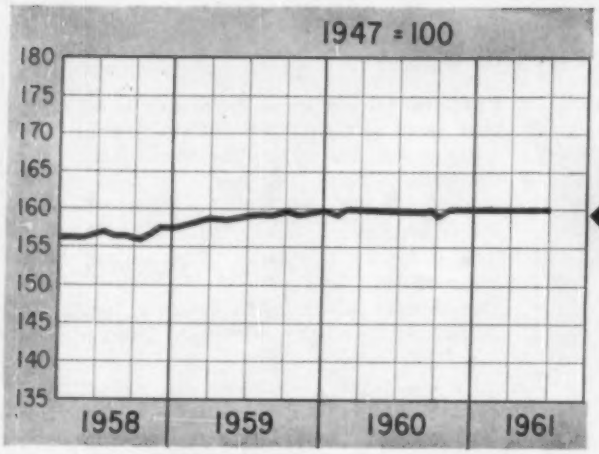


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUN Estimated	APR Preliminary	MAR Revised	MAY Year Ago
Total Index	**102**	**100**	**96**	**108**
Machinery	99	95	102	
Electrical Machinery	111	109	114	
Autos	100	86	115	
Other Transportation .	88	88	89	
Other Metalworking ..	101	100	106	

TRENDS WHAT'S AHEAD... in Business



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JUN Estimated	APR Preliminary	MAR Revised	MAY Year Ago
Total Index	**159.1**	**159.4**	**159.5**	**159.6**
Metalworking Machinery	**193.9**	**195.1**		**190.4**
Other Machinery exc. Electrical	**173.9**	**173.8**		**173.0**
Electrical Machinery	**157.8**	**158.3**		**162.2**
Fabricated Metal Products	**147.0**	**147.0**		**147.9**

Consumer buying to spark the business rise . . .

A brisk pickup in consumer buying seems likely to spur business during the second half of this year. So far, the economy has had to pick up speed without the benefit of a rising level of personal buying. Total retail sales in the first five months of this year have been running at an annual rate of about $18 billion, just a shade lower than the comparable period of last year.

Nevertheless, business in general has been on a distinct upward trend, so a faster pace of consumer buying—the most important single force in the economy—would add quite a bit of extra push to business. There are several good reasons for expecting that consumers will soon be flocking back to the retail markets.

Take home pay is rising again, after standing almost still during the recession. The length of the factory workweek is gradually growing, putting more pay in the pockets of workers already employed. And in addition, both hard and soft goods manufacturers will be calling in new workers soon. Already there have been significant gains in total employment in many sectors of the economy, notably in the primary and fabricated metals industries and in textiles.

More on-the-cuff buying can also be counted on to bolster sales. With jobs becoming more plentiful and their take home pay rising, workers will feel better able to buy on time, and banks will be more willing to lend with the recession over.

So far this year, credit sales have brought little cheer to sellers of the big ticket items. Consumers have been paying off their debts faster than they've been making buy-now, pay-later purchases. With some of their debt burden worked off, buyers are in a better position to replace worn out washers or dryers than they have been for a long time. Thus consumer purchases of durables are expected to rise from $40.5 billion in this quarter to $44 billion in the fourth quarter of this year.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	151.1	150.7	151.9
Steel ingot operation (thousands of tons)	2,042	2,052	1,756
Electric power output (million Kilowatt hours)	15,004	13,887	14,147
Production of automobiles	127,259	85,645	139,423
Engineering construction awards (*Eng. News-Record*—thousands)	$81,098	$81,419	$91,407

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1957=100)*	105	102	109
Index of durable manufactures production (1957=100)*	99	95	106
Durable goods manufacturers' sales, billions	14.15	13.69	15.00
Machinery manufacturers' sales, billions	4.85	4.71	4.83
Durable goods manufacturers' new orders, billions	14.58	13.82	14.47
Machinery manufacturers' new orders, billions	4.79	4.76	4.76
New Orders for Nonelectrical Machinery (1950=100)*	175	169	174
New Contracts for Industrial Construction (1950=100)	133	131	137

*Seasonally adjusted

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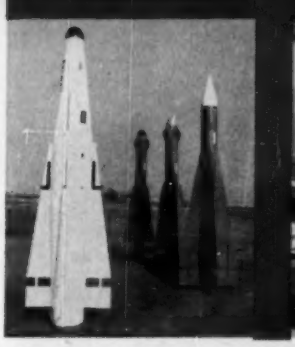
you'll find

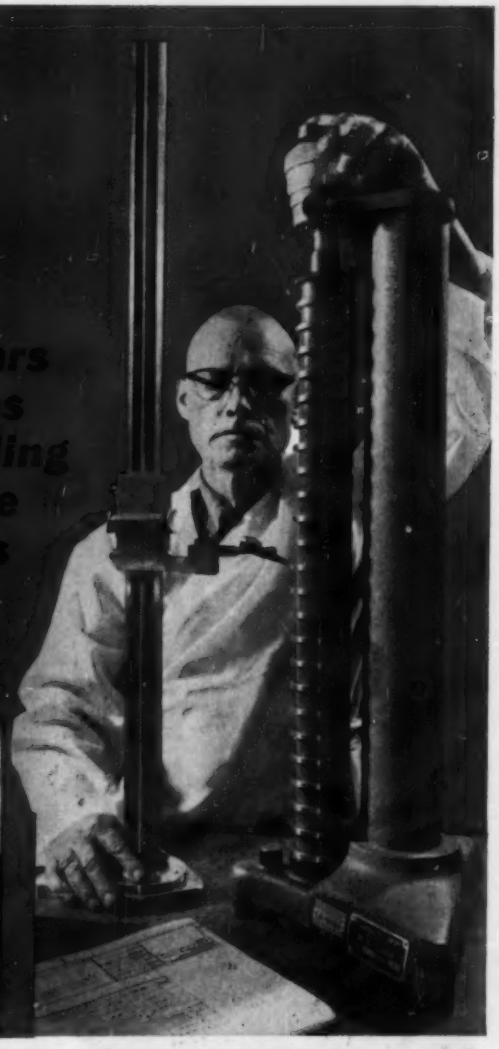
PLA-CHEK® GAGES

example

HUGHES AIRCRAFT COMPANY

where for 10 years PLA-CHEK Gages have been speeding inspections while guarding Hughes precision and quality





Just as the Sentinels of Freedom (at left) stand guard over America's security, so do the PLA-CHEK Gages (center) in one Hughes Inspection room guard the precision and quality of these Falcon Missiles, manufactured by Hughes Aircraft Co.

Nowhere will you find precision and accuracy more demanding than in the manufacturing of guided missiles and airborne electronic armament systems. And volume production demands speed. These are reasons why you'll find so many Cadillac PLA-CHEK Gages at work in the plants of Hughes Aircraft Company.

Ten years ago the first PLA-CHEK went to work for Hughes. Today 120 are in daily use speeding inspections and guarding precision at various Hughes' plants. Here's proof of PLA-CHEK performance.

Speedy inspections? Yes! PLA-CHEK Gages can be set 5 to 20 times faster than other methods of comparable accuracy. Precision? Yes! PLA-CHEK Gages are *guaranteed* accurate to .00005″ through the entire range of the 6″, 12″ and 18″ sizes—to .0001″ through the range of the 24″ size. The 36″ and 48″ sizes are *guaranteed* accurate to .0001″ in any 24″ length and to .0002″ over their entire range.

PLA-CHEK Gages are available in a full range of sizes to meet every inspection and layout requirement either at the surface plate or the machine. Let us tell you how you, too, can speed inspections, maintain extreme accuracy, guard the quality of your work and *save money* with PLA-CHEK Gages. Write for complete, detailed literature.

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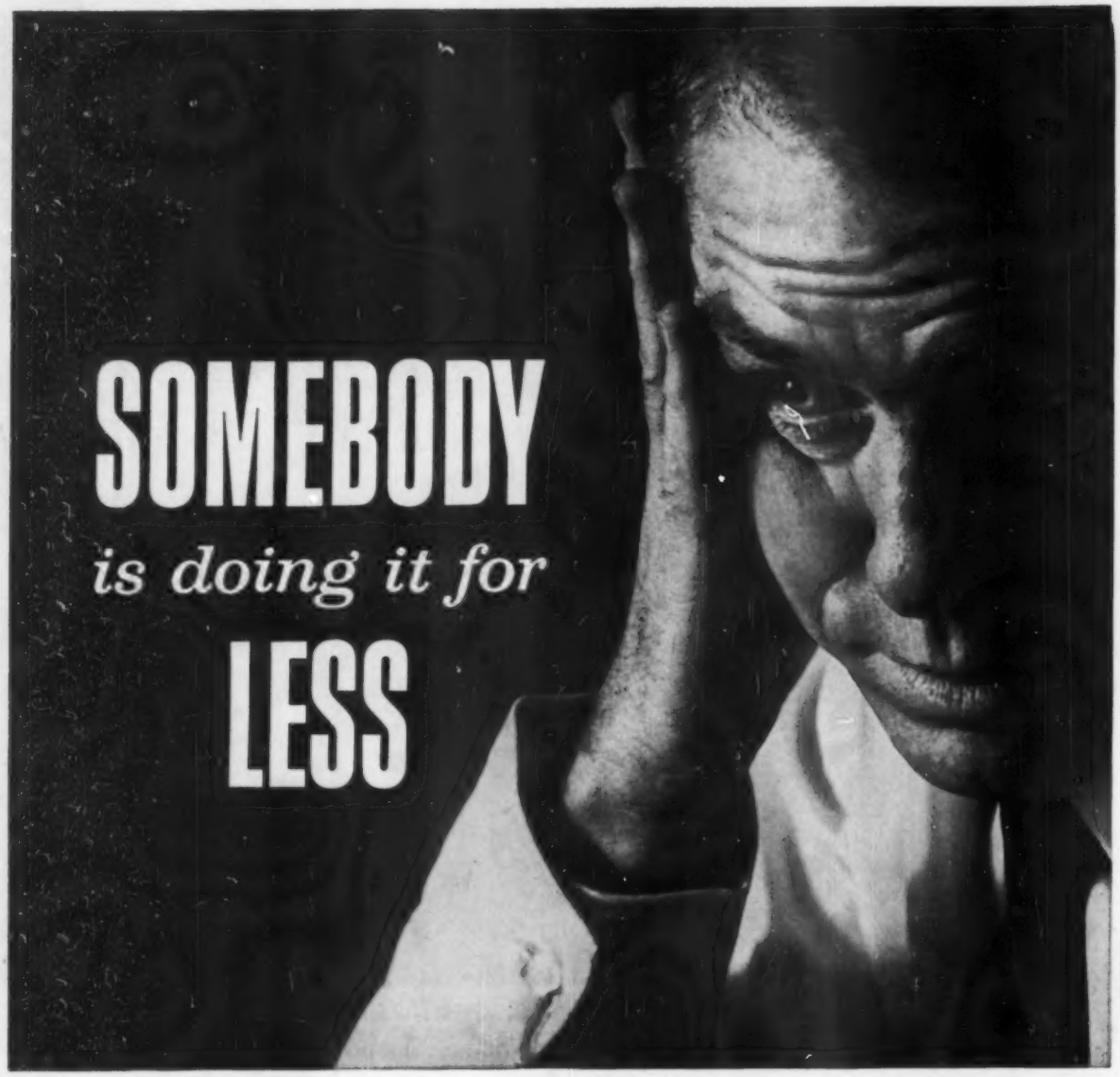

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Newest in the line—for parts not requiring traverse of the Superfinishing stone. A longitudinally adjustable platen supports a reciprocating unit holding one or two stone-carrying quills. Add a second platen and you can handle up to four diameters at once—automatically.

A similar **Model, 52A** offers longitudinal stone traverse. You can select from a complete line of general-purpose and high-production machines and attachments. Call your Gisholt Representative or write for Catalog 1159-C.

Are you giving your competitors a decisive edge by using outdated surface-finishing methods?

If you need a controlled finish (1 micro-inch RMS to 80) on cylindrical, tapered, flat or spherical surfaces, Superfinishing will cut your costs and improve quality.

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You save on initial investment, grinding-wheel costs, production time, work-handling, and floor space. With optional "size control" you can even eliminate final inspection.

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Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

American Machinist / Metalworking Manufacturing ESTABLISHED 1877

The Sooner The Better

We are in the midst of a global fight for survival. Mr Khrushchev made that doubly clear to President Kennedy at Vienna.

Mr K constantly reiterates his belief that Communism will win this fight. A catastrophic war will not be necessary for victory. Successful economic competition will be the determinant.

With his eye never wavering from this final goal, Mr K is busy modernizing Soviet plants and setting up new ones. He is building and installing in Russia's metalworking plants an unprecedented number of machine tools and complete automated production lines.

Western European countries and Japan are doing the same sort of job as Mr K in equipping their factories with new machine tools utilizing today's advanced technology. The aim is to attain high productivity at low cost.

Meanwhile we complain bitterly . . . about being priced out of world markets. The average age of our metalworking production equipment has risen in the past three years. Today, according to estimates by AM/MM editors, 62% of it is at least ten years old. And our machines, on the average, have been getting increasingly older since World War II, with the end not yet in sight.

If we expect to try to retain our world economic leadership, few things are of higher urgency than enactment by Congress of a stimulus to manufacturers to invest in new equipment.

The Kennedy administration is keenly aware of this situation and of the necessity for doing something about it. It recently proposed a tax credit plan as an investment incentive. The plan was dependent upon a firm's depreciation of plant and equipment acquired in previous years.

Critics proceeded to take the proposal apart at Congressional hearings. The loudest protests, apparently a surprise and shock to the administration, came from industry itself which would be the chief beneficiary.

Now the Kennedy administration . . . is reported ready to accept a simplified version of its first plan. A tax credit still is at the base of it. In fact, it constitutes the whole plan. A taxpayer would be permitted to deduct from his tax bill as a credit a stated percentage of the money he spent during the year to acquire depreciable assets.

All manufacturers would be accorded the same treatment. The same percentage of deduction would apply, whether a firm spent five thousand or five million dollars. Reports say that the Treasury favors a 7% deduction.

This new proposal makes sense. The suggested allowable tax credit is not as liberal, to be sure, as some people would like. But it is a start in the right direction.

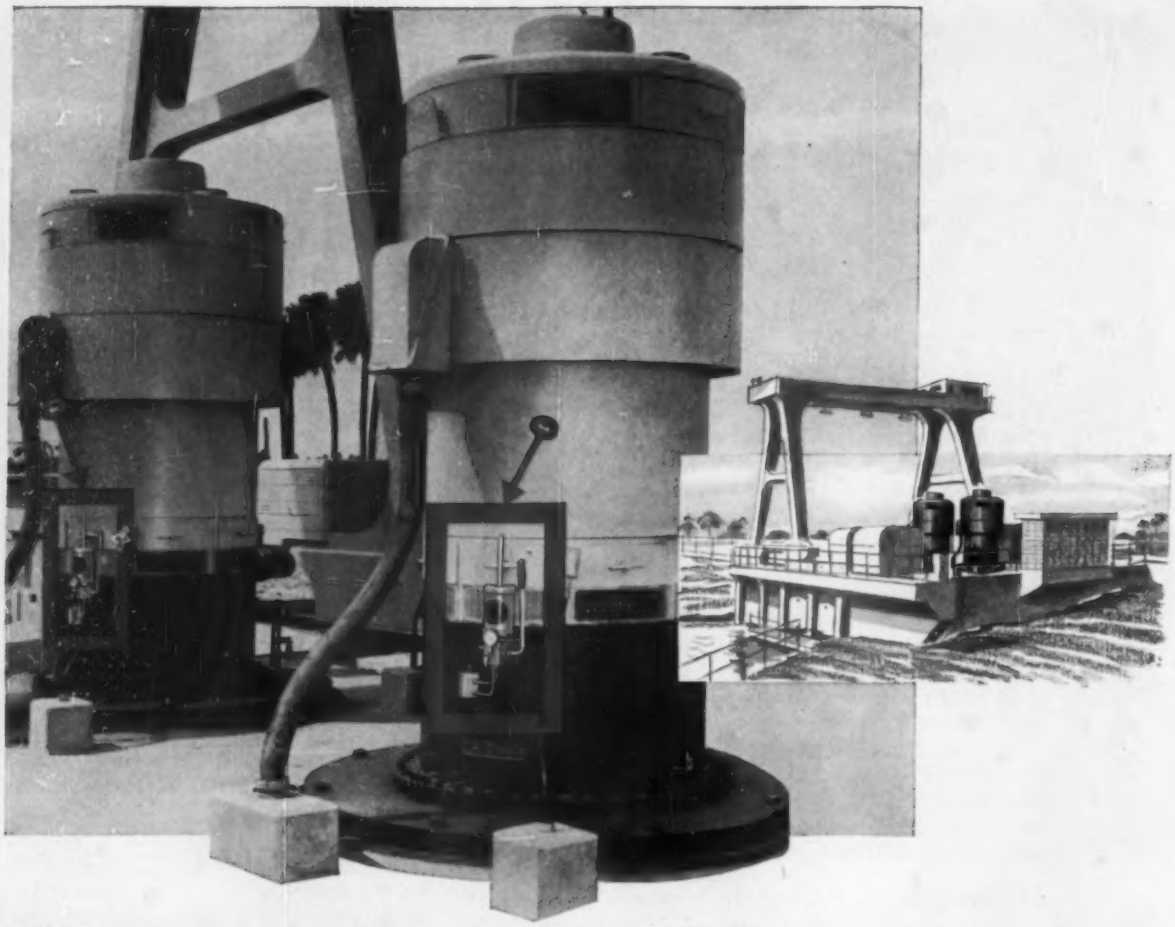
The administration emphatically says that this simple tax credit program is the best that it can offer this year. It is this program or none at this session of Congress, because it represents all the revenue Treasury feels it can forego.

As compensation for this arbitrary stand, the administration renews its promise to make a thorough study of depreciation practices and come up with a reform bill next year.

From the beginning . . . of his administration, President Kennedy has publicly made known his concern about the transcending need for American industry to modernize its plant and equipment. He has said several times that such modernization is essential if the nation's economy is to grow and we are to be able to compete in the world markets.

The men around him have proposed the new tax credit plan devoid of complications and simple enough to understand and administer. Though it does not attempt to correct depreciation inequities, it deserves support by industry and by Congress. The faster it is enacted into the law of the land the better.

Burnham Finney EDITOR



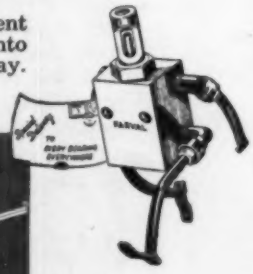
Farval centralized lubrication guards against breakdown of condenser circulating water supply

Once again, two dependable, manually operated Farval Centralized Lubricating Systems were chosen to help keep these C. H. Wheeler mixed flow condenser circulating water pumps operating at a top capacity of 45,000 GPM.

These pumps are most vital to operation of the intake station (shown in sketch) that supplies condenser cooling water for the Orlando Utilities Commission's new Indian River Power Plant in Florida.

Two modern, engineered-for-the-job Farval Systems deliver measured amounts of lubrication, under pressure, to all pump shaft bearings . . . preventing wear, overheated and ruined bearings. This permits maintenance down time to be kept to a minimum and eliminates possibility of bearing failure with subsequent station shutdown.

Remember, for the ultimate in bearing protection on all types of machines and equipment —Farval is the cost-cutting answer. Get the latest information on how Farval can fit into your production picture—it's in free Bulletin No. 27. Write us for your personal copy, today.



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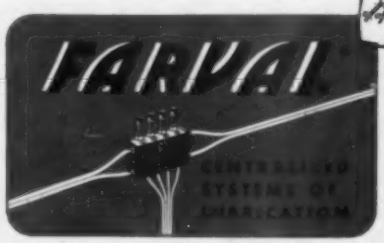
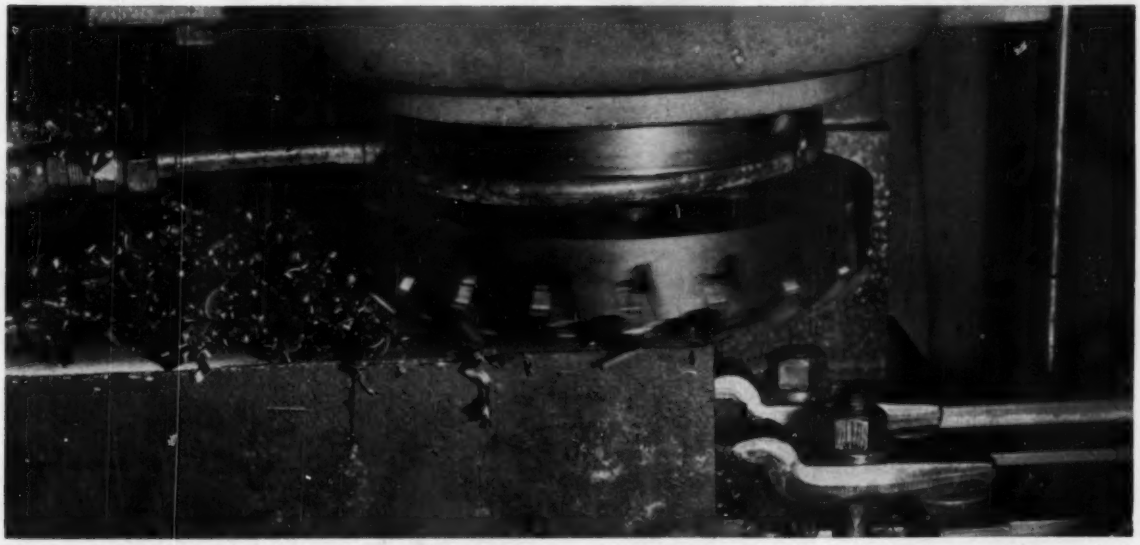


KEYS TO ADEQUATE LUBRICATION

Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated.

Farval Studies in Centralized Lubrication No. 253

VOL 105, NO 13 **American Machinist** / *Metalworking Manufacturing* JUNE 26, 1961



Higher speeds are one advantage of milling with ceramics, but more development work is needed to make it a practical production operation. Pile of chips here is "photographer's license"; cutter normally throws them aside

Ceramic bits mill hardened steel

Ceramic throw-away inserts have shown what they can do in turning—cutting at higher speeds and cutting harder materials. Now a new development lays the groundwork for bringing these advantages to milling

Milling with ceramic throw-away inserts? Yes—Watervliet Arsenal is cutting hardened steel (380 to 400 Bhn) at 375 sfm, which is a good deal faster than carbide tools can go. Surface finish is better, too—about 80 microinches

In depth of cut, however, the ceramics don't compare quite as well. They have only made ¼-in.-deep cuts so far, and carbides, with adequate horsepower, can go as deep as an inch in this material.

Carbides are cheaper, too. With ceramic bits selling at about twice the price of carbide and cutting less than twice as fast, there's obviously no cost advantage, even in the ¼-in. cuts. However, the ceramics are only getting started in milling.

Other work has been done along this line, but so far as engineers at Watervliet know, nobody else has reached these cutting speeds or depths. Even at this point, though, they aren't talking about production.

The setup is definitely experimental, but it does prove that ceramic milling is possible. It points the way to future developments and a number of interesting possibilities.

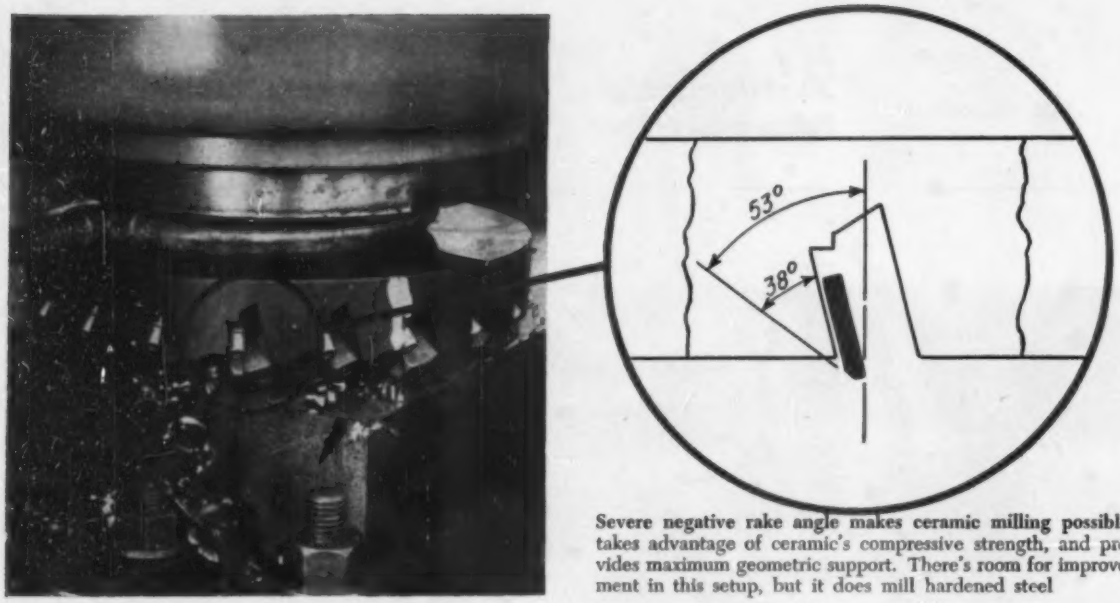
One possibility lies in milling harder materials. In addition to cutting at higher speeds, ceramics can cut much harder materials than carbides can. In turning operations, carbides have considerable difficulty with anything harder than Rh 46C (450 Bhn), but the ceramics can go up to Rh 65C, according to Watervliet's Machine Processes and Tool Development Section.

That isn't true yet for milling, but it's an indication of what the future might hold. And there's another real potential in difficult-to-machine materials.

How the operation works

But where do we stand now? The experimental operation at Watervliet is face milling a billet, 9½ in. wide by 18 in. long, with an 11-in.-dia milling cutter carrying 10 ceramic throwaway inserts. The material is 4340 modified gun steel, hardened to 380 to 400 Bhn, a typical production material at the Arsenal.

The cutter actually has pockets for 20 inserts, but with all 20 installed, it loads up with chips. This could be



Severe negative rake angle makes ceramic milling possible, takes advantage of ceramic's compressive strength, and provides maximum geometric support. There's room for improvement in this setup, but it does mill hardened steel

corrected by an air-blast system or some other provision, but for the development work it was simpler and just as effective to install half as many teeth.

The cutter rotates at 130 rpm, and the rate of feed is 5 ipm. Thus, with an 11-in. cutter, the speed is 375 sfm, and the tooth load is 0.004 in. per tooth. With these conditions, the ceramic bits were able to cut about 150 linear inches in the billet (cuts varying from ⅛ to ¼ in.) before any of them had to be replaced.

Tool life by itself may or may not be significant. Too much tool life in a production operation usually means that the job isn't going fast enough. In this experimental operation, though, it indicates that the ceramic bits do hold up while cutting hardened steel.

The key—tool geometry

Tool geometry is really the heart of the operation, and Watervliet found that it takes a severe negative rake angle of 53° to make it work. "This geometry takes advantage of the compressive strength of the ceramic tool material," says John W Rodd of the Industrial Processes Branch, project leader for the development.

He adds that "the compressive loading is largely into the mill, which backs up the ceramic material and provides maximum geometric support." The insert itself is ground to a negative rake of 38°, and the recess in the cutter has a negative axial rake of 15°—total: 53° negative.

Some of the success, however, should also be credited to the milling machine that performs the operation. It's a heavy 50-hp production machine—a Cincinnati No. 5 vertical mill, to be exact, With its mass it has enough inertia, or flywheel effect, to keep the cutter moving smoothly. A lighter machine would require special precautions to eleminate vibration.

There's plenty of room for improvement, though. Watervliet engineers are the first to point out that the experimental setup is actually rather crude—not much more than just enough to prove the job can be done—and they say development could proceed in several directions.

For one thing, the tool geometry is not necessarily the last word. It does the job, but further experiment with different angles might produce something a good deal better.

The *grade* of ceramic is also subject to investigation. The one now employed has a compressive strength of 450,000 psi and a transverse rupture of 65,000. Additional development work might prove that another grade would do the job better.

For another possibility, there is lots of room for improvement in the backup for the ceramic inserts. The present face mill is a standard model, not altered in any way.

One trouble is that the toolbit clamps are not quite right for the present ceramic tips. They allow a little too much tip overhang, so there's an unnecessarily high risk of cracking.

Add to this the fact that the cutter is all steel, even the clamps. The first improvement here would be to back up the ceramic with carbide. Carbide has a modulus of elasticity three times as high as steel's and therefore provides that much more rigid a support for the ceramic.

The more rigid support, of course, helps combat the serious cracking tendency in ceramic tools. And if you wanted to go the limit (for extra-heavy cuts or other extreme conditions) you could make the whole cutter out of carbide.

Where do we go from here?

These developments, and others, may very well put ceramic tools in an important position in milling, especially for milling hard materials. Dominick Bisceglia of Watervliet says that the present position of ceramic milling is comparable to ceramic turning when a 20-min tool life was considered good, even on 0.010-in. skim cuts.

Now these tools are rough-turning 105-mm gun tubes at a metal-removal rate of 30 cu in. per min, and they're making a cut 140 in. long. That's quite a bit better than the 11.5 cu in. per min now possible in ceramic milling, but maybe ceramic milling will make a similar improvement.

Who is going to do the development work? That's anybody's guess, and anybody can get into the act. Watervliet has shown that ceramic milling is possible, but from here on, it's up to private enterprise. •

How 42 British experts appraise Soviet production:

	GOOD	FAIR	POOR
Machine Tool Quality	32%	55%	13%
Gage and Instrument Quality	26	55	19
Maintenance of Equipment	3	13	84
Worker Efficiency	28	59	13
Technical Training	88	12	0

Soviet plants rated by British team

LONDON — The picture Russia has painted for the outside world of Soviet machine tool manufacturing efficiency is daubed with the broad brush of propaganda according to 42 British engineers and plant executives just back from a tour of factories in the USSR.

The English experts, all veterans in engineering and factory management, said that the Russians are well ahead of the British in electrical discharge machining and in the use of ultrasonics but that in general operating efficiency they are a far cry from what they claim to be.

At the same time, the group, all members of the British Gauge and Tool Makers' Assn, felt that the extensive mass technical training now being given would probably offset inefficiencies in five to ten years.

Polled by the AM/MM representative, who accompanied them on their tour of plants in the Moscow area, the group gave the assessment shown in the table above. In addition, 53% rated British selling opportunities as poor, 26% fair, and 21% good.

Production figures doubted

Plant managers had briefed the group on production figures and 78% felt the data given was exaggerated. Of the rest, 19% felt the figures were accurate, and 3% (1 man out of the 42) wasn't sure.

"In the Kalibre plant (measuring tools), they gave us their figures for screw thread gages," R W Griffiths, a director of Talbot Tool, said. "After we toured the plant and saw how many grinders they had, it was obvious that even if they were working three shifts the production had been exaggerated by four times."

"Working conditions," said F Midgley, managing director, Bell Precision Engineering Co, "wouldn't be tolerated by British trade unions. Maintenance seemed non-existent. In due time they are going to have serious problems."

There was no evidence of safety precautions. Presses were run without guards. As one man said, "If we did that, government safety inspectors would close us down."

Limited inspection

One member of the group was amazed at how little instrument control there was on their production lines. Another said they seemed to be sacrificing accuracy for mass production.

"I saw no Russian equipment in the testing rooms," said M Pryce, director of George Taylor & Son (Engineers). "It was mostly German, Swiss, and American. Although well-equipped, there was little evidence of much use being made of the testing rooms."

The group visited a cross-section of industry ranging from heavy manufacturing, such as the Orjonikidze machine tool factory and the Frezer drill plant, to light manufacturing, such as the Premier watch works and the Kalibre plant.

It was the general opinion of the group that they had not been steered into second-rate plants, but had seen a fair cross-section.

Favorable impressions

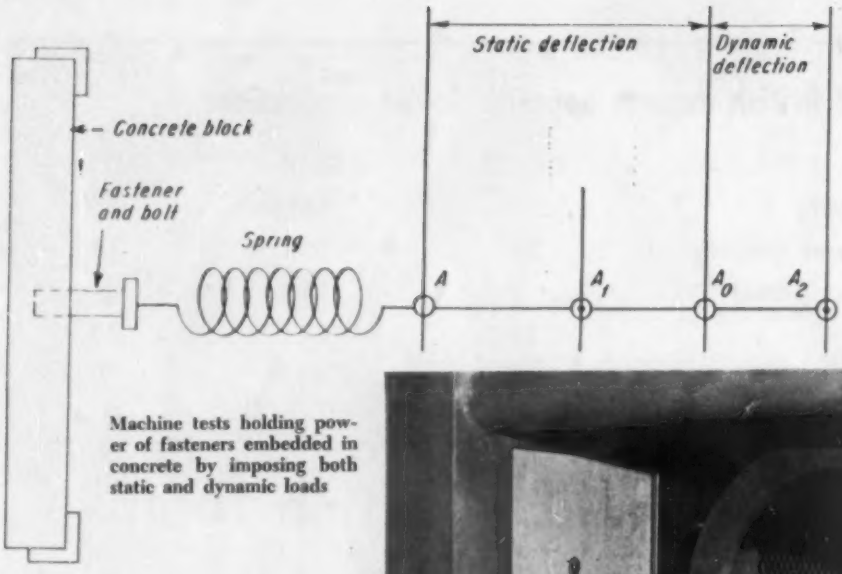
Developments that favorably impressed the visitors included the transfer machines and the use of carbide tools.

"They were making good use of tungsten carbide tip tools," said J C Dawkins, managing director, Diagrit Grinding Co, "They had carbide chipbreakers brazed to the tip and not ground in as is the normal procedure in England." Also surprising to Dawkins was that "on the grinding machines no single-point diamonds were used for wheel dressing."

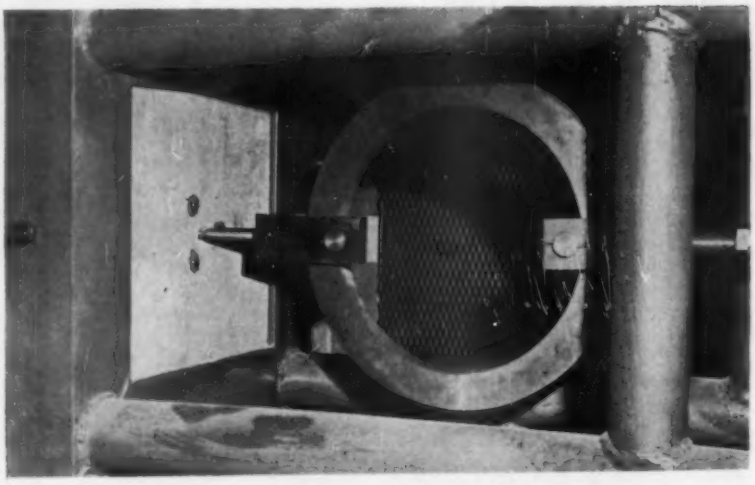
One member of the group reported that the Russians were removing metal with electrical discharge machines at 3500 to 4000 cu mm per min using graphite electrodes. "That is about four times faster than we can do it in the United Kingdom," he said. [*Ed. Note: This removal rate amounts to a maximum of 0.244 cu in. per min. An Elox machine introduced in the U S last year is reported to have a metal removal rate of 0.33 cu in. per min and other US machines probably have rates higher, though no known EDM machine—including Russian—can produce a fine finish at such rates.*]

The group was most impressed by the training in technical institutes and the way classroom work is synchronized with regular plant operations.

The opinion of many of the group was summarized by G Verdon-Roe, managing director, Vero Precision Engineering, when he said: "Despite creditable developments, something was very wrong. If British and American plants were given the same opportunity for specialization that Russian factories have, we would be much further advanced. I came away with the impression that they were somewhat disorganized. I suspect they are victims of their own bureaucracy." •



Machine tests holding power of fasteners embedded in concrete by imposing both static and dynamic loads



What will SHAKE a fastener loose?

Tests indicate that vibrating loads can safely go up to 10% of recommended static load, but how high can they go beyond that? We need many more tests to find out

By B E Quinn, professor of mechanical engineering, and O D Lascoe, professor of industrial engineering, Purdue University

Vibration—and the effective mounting of vibrating equipment—are recognized as extremely important problems in the metalworking industry. However, they are like the weather: Everybody talks about them, but nobody does anything about them.

Virtually all types of fasteners are catalogued with their recommended static loads. Yet there is still no comparable set of recommended limits for vibration loading. You can plan ahead for the static load to be imposed on the fastener, but when it comes to the vibrational load, you have to fall back on guesstimating.

Surely we have reached the point —with today's almost infinite variety of rotating and reciprocating equipment—where we simply have to know which fasteners will hold and which fasteners will fail because of the combined static and vibrational load.

Holding power in concrete

The factor we are most frequently concerned with is the holding power of a fastener embedded in concrete or some similar material. We can assume the bolt itself will be strong enough, but failure may still occur in one of two ways. The bolt may come loose in the fastener, or the fastener itself may pull loose from the concrete.

The static forces on a fastener are the tension caused by tightening down, and in the case of a piece of equipment suspended from the ceiling, the weight of the equipment.

Where vibration starts

Vibrational forces may come from any unbalance in the drive motor or the equipment it drives, and they may also come from the kind of work the equipment is doing.

For an example of both static and vibratory loads, consider a motor-driven unit mounted from the ceiling. Here the bolts are supporting the weight of the motor and the frame as well as the tension caused by tightening the bolts. And when the motor starts up, there will also be a vibratory load that will depend on both the amount of unbalance and the frequency at which this force is vibrating.

Fastener Size (in.)	Static Load (lb)	Dynamic Load (lb)	Frequency (cps)	Total No. of Cycles	Change in & After Test	No. of Tests
¼ (Heat Treated Steel)	1000	100	43	250,000	(See Note 1)	2
⅜ (Heat Treated Steel)	1544	155	43	1,000,000	(See Note 2)	4
⅝ (Heat Treated Steel)	3169	317	43	1,000,000	0	2
⅜ (Lead)	1400	155	43	750,000	See Text	2
⅜ (Lead)	Failed when initial load was applied; pulled out before ring could deflect 0.001" on indicator reading.					

NOTE 1: Test unsatisfactory due to yielding (possibly due to crooked mounting of fastener in concrete.)
NOTE 2: 0.001 change observed at 500,000 cycles for fasteners #3 and #4. No further change noted at 1,000,000 cycles.

This raises two big questions:

- How large can the fluctuating force become before the fasteners loosen?
- Does the frequency of vibration actually affect the holding power of the fastener?

In an effort to obtain some fundamental information on this particular situation, we developed the necessary equipment and conducted a series of tests. With this equipment, we could establish any specific static, or initial load, and then apply an additional vibratory load of any magnitude and frequency.

How the tests were run

As shown in the schematic sketch, the fastener to be tested was installed in a concrete block, and then a bolt was fitted into the fastener. The spring attached to the bolt has its free end at point A when no load is applied.

The initial load is applied by moving the free end of the spring from A to A_0. Then, to produce the fluctuating component of force, the free end is oscillated between A_1 and A_2, which are equidistant from A_0.

The actual test equipment is shown in the photographs. Here, the spring has been replaced by a steel ring in order to reduce the amount of deflection needed for a given load. However, the sketch and the picture are functionally the same.

The first step in each test was to load the bolt and fastener with the safe working load (static) of the concrete fastener (see Table). If no yielding was observed after 16 hours under this static load, the vibration phase of the test was started.

The fluctuating force was established at 10% of the safe working load, and each fastener was subjected to one million cycles of operation.

At the start of this phase, measurements were made frequently to determine the extent of loosening. If no loosening was observed the measurements were then made every 250 thousand cycles.

All of the steel fasteners passed the 16-hr static test without loosening. Further, a week-long static-load test on a ⅝-in. bolt failed to cause any observable amount of creep. In the vibration test, the steel fasteners also performed well, except for the ¼-in. fastener as noted in the table.

Since the patented self-drilling concrete fasteners showed virtually no loosening, we decided to conduct a similar test on bolts retained in the concrete by typical lead fasteners.

The results here were not satisfactory. The ⅝-in. fastener failed when the initial load was applied, and the ⅜-in. fastener yielded during both the static test and the vibration test, so the desired load could not be maintained.

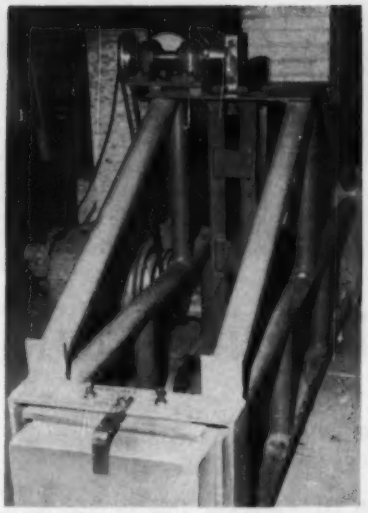
What the tests show

At first glance it may appear that the tests of the steel fasteners were also unsatisfactory because virtually no loosening was observed for the operating conditions selected. However, they do point out that the important question is still unanswered: What forces *will* cause loosening?

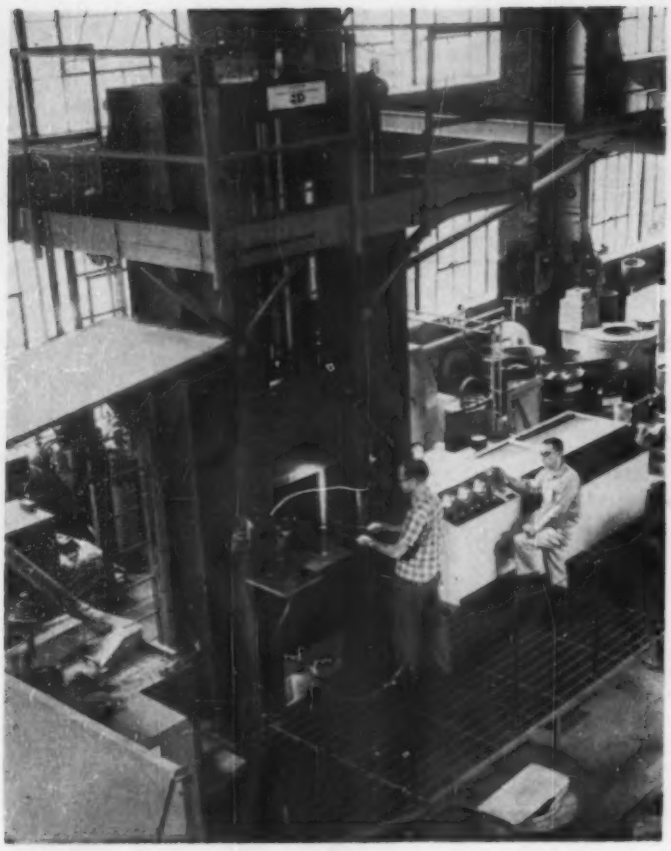
We can say that, if a fastener embedded in concrete can hold its recommended static load for 16 hours, it can safely carry a fluctuating load up to 10% of the static load when the frequency of vibration is 43 cycles per second.

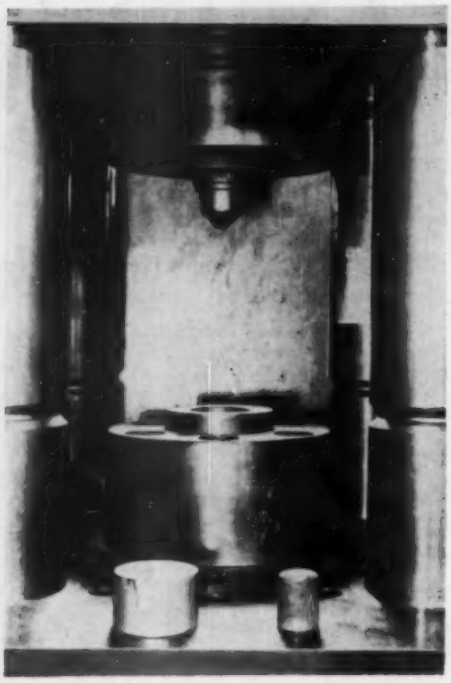
But it may be possible that very large fluctuating forces will still produce no loosening. If this is true, it should be verified experimentally in order to develop application recommendations that would take full advantage of the holding power of the fasteners. The rate of vibration should also be investigated to see what effect it has on holding power.

The tests described here are only a starting point. A great many more tests must be run to develop a reliable body of information. •



Test includes 16 hr of static load and one million cycles of static and dynamic





Power to Spare—Model 1810 Dynapak is rated at 430,000 ft-lb, but only 30,000 ft-lb has been used so far to make experimental forgings. Thickness tolerances about one-third those allowed on commercial forgings have been achieved. Stroke is 15 in., and extrusions up to 100 in. long can be made through the bolster

Forging tough metals in one blow

By Rupert Le Grand,
senior associate editor

It takes just one blow to forge aircraft-quality 4130 steel, tough-pitch copper, or copper-powder compacts on a big new vertical 1810 Dynapak at American Brake Shoe's Mahwah, N J, plant.

Such forging is still on an experimental basis at Brake Shoe, which is trying to find out just what can be done with the Dynapak to produce close-tolerance, dense, grain-oriented forgings in alloy steels, exotic materials, and powder metals.

The latter, incidentally, are pretty exotic in themselves, are tailor-made by the addition of elements not used in melted materials. Forging such mixtures produces strength, density, and shapes either impossible or impractical to attain with powder metallurgy techniques alone.

The goal of the experiments is to take advantage of the special characteristics of Dynapak forging to pin down "exotic" jobs. So far, all the materials have been worked hot, for example, but it is foreseen that powders will also be worked cold.

Studying Dynapak's capabilities for forging and extrusion are research metallurgists Grant MacDonald and Hugo Larsen, who are working in Brake Shoe's Research Center, which is equipped with complete supporting facilities for exploring and evaluating the Dynapak forging process.

How the machine works

Convair's 1810 Dynapak is a vertical machine which looks much like a forging press, except that it has a large control console and pumping unit at one side, and a bank of gas cylinders.

Neither a flywheel, crankshaft, nor hydraulic cylinder actuates the ram at conventional forming speeds. Instead, the ram is "fired" by the sudden release of gas compressed to 2000 psi, achieving a velocity up to 150 ft per second.

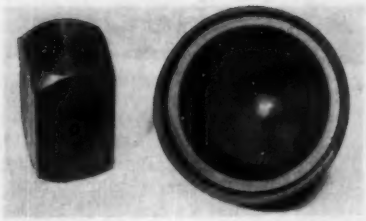
Thus the machine is capable of exerting 430,000 ft lb of energy to achieve the same plastic flow of metals as does explosive forming.

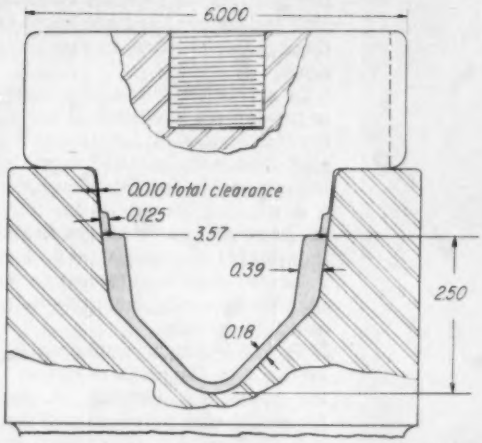
High-pressure gas is stored in one chamber of the Dynapak's double-chamber cylinder (*AM/MM*—Nov 17, '58, p239); the other contains a piston, piston rod (ram), and low-pressure gas.

During make-ready for the next cycle, the gas in the low-pressure cylinder is compressed by pumping in hydraulic oil until the piston face is forced against a narrow seal surrounding a large orifice in the high-pressure chamber.

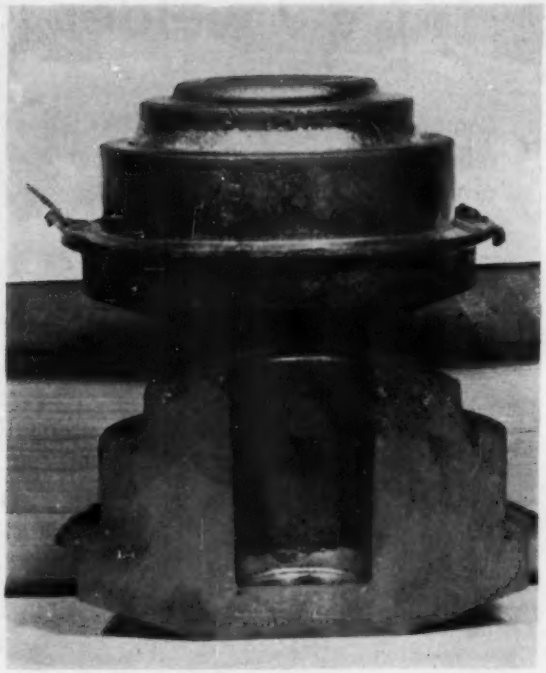
When the seal is made, the hydraulic oil is withdrawn and the low-pressure gas holds the piston in position against the seal and keeps the system in equilibrium.

To trigger a blow, when a piece is





Metal Movement—To produce a steel piston head (above), a 4130 steel slug measuring 2⅛ x 3 in., is pierced and backward extruded with 2% chromium dies hardened to Rh 50 C. So far the punch has formed over 100 pc, developing and maintaining the glaze desired by forge-shop operators. Test die sketched represents extremes in metal movement, yet concentricity is usually with 0.003 in.



Grain Refinement—Besides coping with severe metal movement while giving "precision quality" tolerances, the high-energy forming process refines the structure of the copper forging for a steel-mill oxygen lance (above). This 10-lb part requires piercing a central hole (see cut-away section) to close tolerances for size and finish, as well as forming the beveled face and the stepped diameters

to be forged, the pressure in the high-pressure chamber is increased slightly, and the piston is forced away from the seal. Now the high pressure gas rushes through the large orifice, overcomes the pressure in low-pressure chamber and drives the piston down at high velocity. Virtually all of the energy imparted to the piston is transmitted to the work. Cycle time is about 1½ min.

Forging 4130 steel

Brake Shoe's first job was a conical piston-head made of 4130 steel (aircraft quality). The shape (developed to minimize machining) was chosen to demonstrate the ability of Dynapak to forge difficult materials. All flash is thrown into a thin ring at the outside edge, where it can be trimmed off readily. Grain orientation is excellent, and even though movement of the metal is severe, there is no splitting or cracking.

The billet is heated in a salt bath to 2150F. Finished weight of the forging, with virtually no scrap loss, is 1.75 lb. The punch and die are lubricated with a graphite-water mixture.

A tough-pitch copper part, intended for use in a steel-mill oxygen lance and weighing about 10 lb, presented a major forging difficulty in piercing a 1¼-in.-dia hole, 2½ in. deep. An excellent low-micro finish is produced on the walls of the hole.

It's probable that the lance head could be machined at no more cost than a combination of forging and machining, but wear life of the forged part may prove better. Reason: in forging, the grain structure of the metal is refined considerably.

Forging powder-copper

The third part forged at Brake Shoe is a duplicate of the first one, except that the slug is 65% density powder-copper compaction. Weight of the compact is 2.10 lb; its dimensions 2⅛ x 3 in. Heating to 1450 F is done in a reducing atmosphere.

Before heating, the slug is coated with a water solution or slurry of borates and phosphates, Phosphatherm RN, distributed worldwide by Alpha Molykote Co, Stamford, Conn, under license from the developer, a leading West German steel plant.

As with the steel counterpart, no difficulty is experienced in forging the powder-metal piston nose. The developed slug flows readily and uniformly in the die, the flash is very slight and well distributed about the open end of the conical part. No cracking or failure to fill the die was observed.

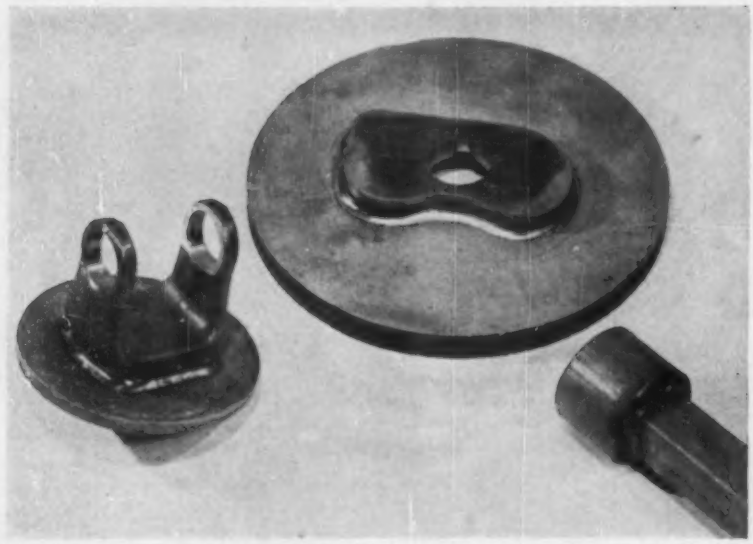
On its prototype work, American Brake Shoe has used only about 30,000 ft-lb or 7½% of the Dyanpak's power. Great efficiency in movement of metal, or hydrodynamic behavior, can be expected at higher power outputs. Therefore, it is expected that the work done so far will be far outstripped in size, complexity and unusual character.

Close tolerances

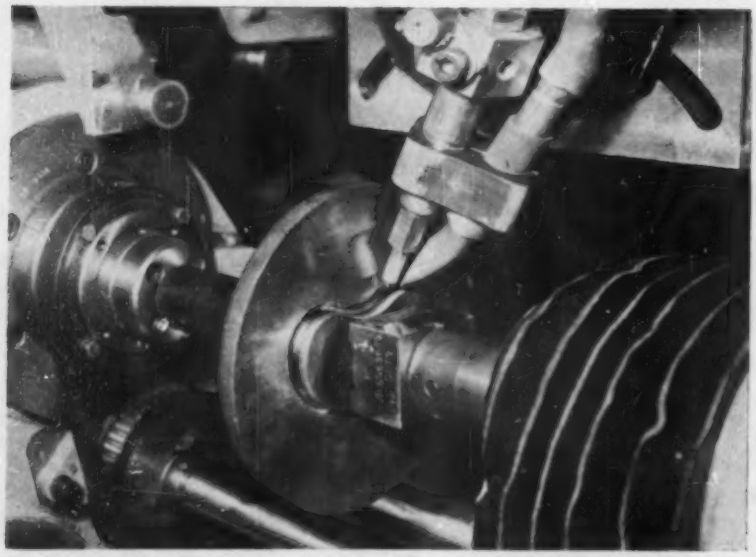
The conical section of the piston head (see drawing) is forged to 0.180 ± 0.005 in. for wall thickness and ± 0.010 in. for concentricity. The thicker section above is forged to 0.390 in. ± 0.006 in., and the concentricity measurements do not exceed ± 0.008 in. By control of metal movement, in die design, the amount of machining on this piece is made almost negligible. •

New welder joins odd shapes

Contour-welding machines can ordinarily handle only a limited number of specific jobs. But this one needs only a new set of control cams to produce regular welds on almost any irregular contour



All these contour welds are made on the same machine. A different set of plate cams controls each operation, maintaining constant conditions regardless of joint contour, but the cams can be changed from job to job in a matter of minutes. The machine is designed to weld any contour that fits within a 6-in. diameter



Workpiece and torch motion for this contour are coordinated by cams shown on next page. Welding head moves up and down and left and right as directed, but quadrant adjustment (top) is bolted down, does not change during operation

Irregular shaped joints are the toughest kind to weld automatically, but the universal welding machine shown here takes them right in stride. It can weld combinations of straight lines and curves (both concave and convex) and just about anything you can draw in two dimensions.

In production work, the machine is turning out a variety of parts for the Universal Joint Division of Rockwell Standard. Installed recently at the company's Fairfield, Iowa, plant, it is welding assemblies for universal joints of various designs and joining plate assemblies and forged yokes to round, square, and rectangular tubing—in typical cycle times of about 20 seconds.

To make these irregular welds automatically, the machine has to have the customary controls, of course, for power, electrode feed, and shielding medium, but in addition, it has to control the relative motion between the torch and the work. Like the human operator, its aim in this is to maintain constant welding conditions from start to finish:

- constant linear welding speed along the weld line
- constant angle of torch to the weld line
- constant angle of weld line to the horizontal

Cams coordinate motion

Three simple plate cams in this machine coordinate the motion of torch and work to hold all these factors constant. It's a purely mechanical control—a rarity in these days of complex electronics—but it's still flexible. It can handle parts of many sizes and shapes, and cams can be changed in a matter of minutes.

Produced by Expert Welding Machine Co, Detroit, the machine was designed by John H Brems, chief engineer. His aim was to solve the problem of having to design a costly, special-purpose machine for each new contour-welding application.

Built something like a lathe, the machine rotates the work under a welding head. One of the workpieces is held by a chuck or a nesting fixture on the headstock, and the other is pressed firmly against it by the tailstock (rotated in synchronism with the headstock by a jackshaft). Tack-welded assemblies, though, can be held in the headstock alone by a regular collet or chuck.

During the welding operation, the three cams adjust (and coordinate) the functions that determine the relative motion of work and torch:

- rotary speed of work
- up and down motion of head
- left and right motion of head

If the weld contour happens to be a circle, there's no need for cams; the work rotates at a constant speed, and the head remains stationary. For an irregular contour, however, the cams may be working continuously to maintain constant linear speed, constant torch angle, and constant angle of weld line to the horizontal.

By holding these optimum conditions, the equipment can produce good welds regardless of contour.

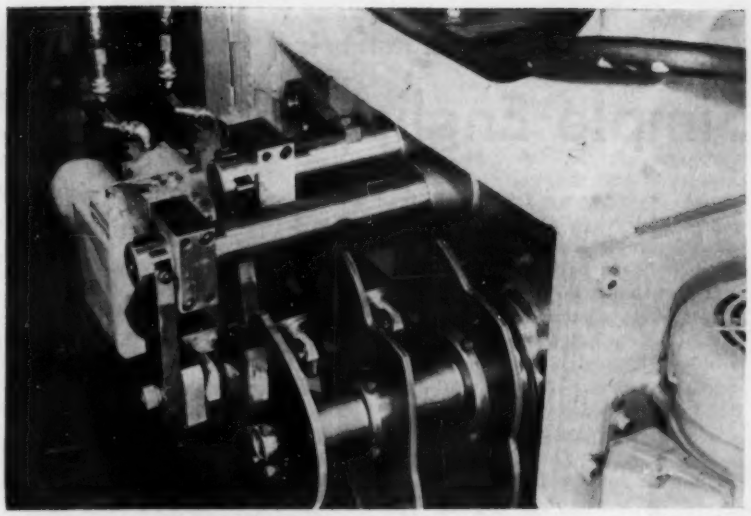
Effect of welding speed

Constant welding speed is normally desirable because it means uniform filler-wire feed per inch of weld and constant heating and cooling conditions. However, special situations may call for non-constant speed—a critical stress point, for example, that needs a heavier weld deposit. Suitable cam design will take care of either requirement.

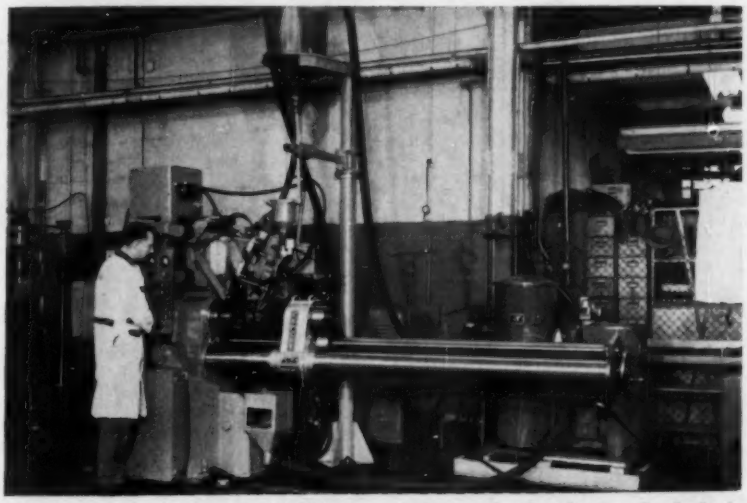
With constant torch angle, the electrode always feeds into the weld at the same angle. This feature, along with constant angle of weld line to the horizontal, is controlled by integrated action of the cams.

The speed cam works through a follower, torque bar, gear rack, and planetary-gear arrangement that works on the output (work-carrying) shaft. As the cam contour falls, the rotary work speed drops off; as the cam rises, the work rotation speeds up.

The other two cams control welding-head position through simpler mechanisms: followers, torque bars, and levers.



Three cams behind headstock control horizontal head motion, vertical head motion, and speed of rotation. Simplified cam-design procedure takes about eight hours



Long-bedded machine can weld fittings on shafts, has headstock pivot for bed tilt. It does submerged-arc welding here but could work with other automatic processes

Cam design is simplfied

The three cams must be designed to integrate head motion and speed so the electrode will always work as though welding along a tangent to the work contour. This could involve some complicated mathematics, but the cam-design procedure has been reduced to a formula—much like an income-tax form — that can be worked out in about eight hours.

A typical job will show how the cams cooperate to maintain optimum geometry, regardless of work contour. A square shape with rounded corners is welded first along one flat with the welding head moving horizontally to the right—no part rotation at all and no vertical motion.

When the weld reaches the rounded corner, the part starts to rotate, and the head has to start rising and moving to the left. Then vertical and horizontal head motion integrate with rotation until the corner is completed. At this point, the second flat is horizontal, ready to be welded by a straight horizontal pass.

The three cams make this machine very flexible, of course, but it has two additional adjustments that make it even more so. One is a pivot under the headstock that lets the whole bed tilt, raising the axis of rotation of the work. This would be helpful on a workpiece with an overhang that would otherwise get in the way of the torch.

The other adjustment rotates the workpiece about the axis, something like advancing the spark on an old car. This permits the machine to weld at any point in advance of top dead center on the joint contour so the metal will solidify at top dead center—or any other point chosen by the operator. Thus, puddle behavior can be controlled to make either a concave or convex weld bead.

The unit delivered to Rockwell Standard is equipped for submerged-arc welding. However, the same machine and cam arrangement would work equally well with any other automatic welding process. •

Two new advances in numerical control...

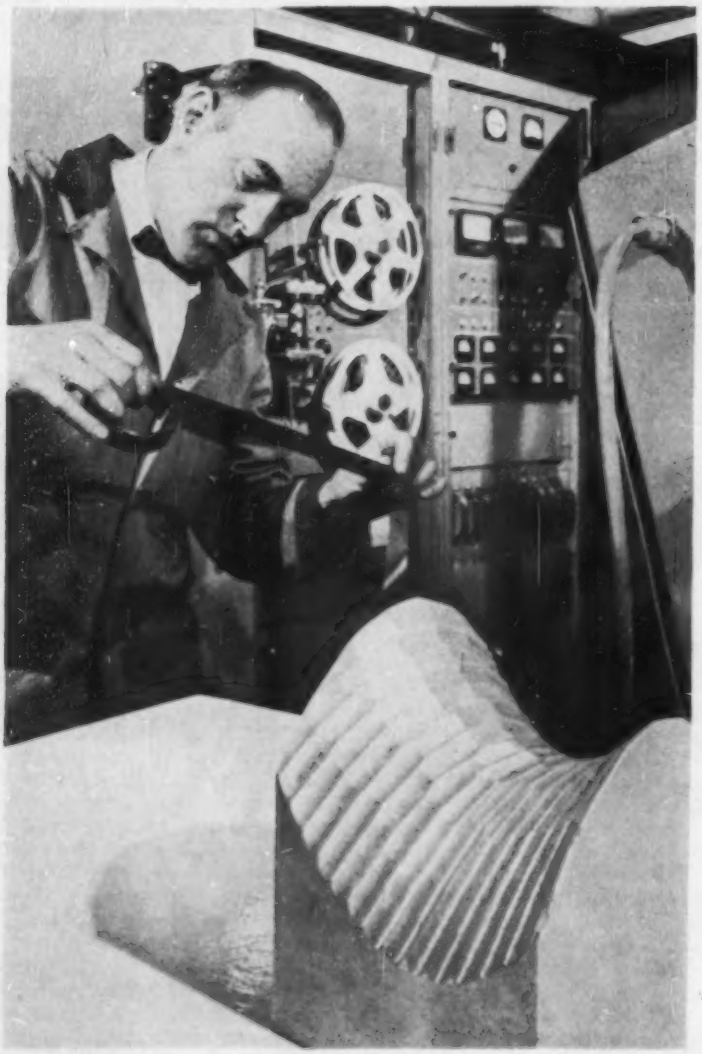
Simple English makes N-C tapes

"Bowl = Sphere, Inside / Center (0,0,0) Radius (1.75)."

These simple words and numbers, which define a bowl-shaped surface on a part that is to be machined, are addressed to a computer. They are part of a new language (vocabulary is only 110 words) that promises to speed preparation of numerical-control tapes significantly.

Computer languages are nothing new (see "APT—The Language That Commands Machine Tools," *AM/MM* —Mar 9 '59, p106). But one feature of this latest one is: For the first time, the programmer has only to *describe the surfaces* of the three-dimensional shape to be machined, rather than each path that the tool must follow. He can leave to the computer the tiresome task of generating these tool paths and preparing the detailed instructions that go into the control tape.

The new language is part of IBM's just-announced Autopromt program (Automatic Programming of Machine Tools). Developed in cooperation with United Aircraft Corp, the program was written for IBM's 704, 709, and 7090 computers.



Numerical-control tape, which directed machining of hyperbolic-paraboloid in aluminum block, is product of Autopromt language fed into a computer

Striking time savings

Here's one example of how tape preparation has been simplified and speeded up: At United Aircraft, a tape was needed to control a Pratt & Whitney Numeric-Keller that had to mill a complex gearbox cover for a helicopter. Working from blueprints, programmers wrote (in the Autopromt language) 180 one-line statements that described the part completely. The description then was fed into a computer, which automatically generated more than 8000 tool-path instructions that spelled out to the miller every tool motion needed to machine the part.

Result: The milling job was completed in about one-fourth the time required by conventional methods. And lead time from blueprint to production was only two weeks, instead of the three months normally required.

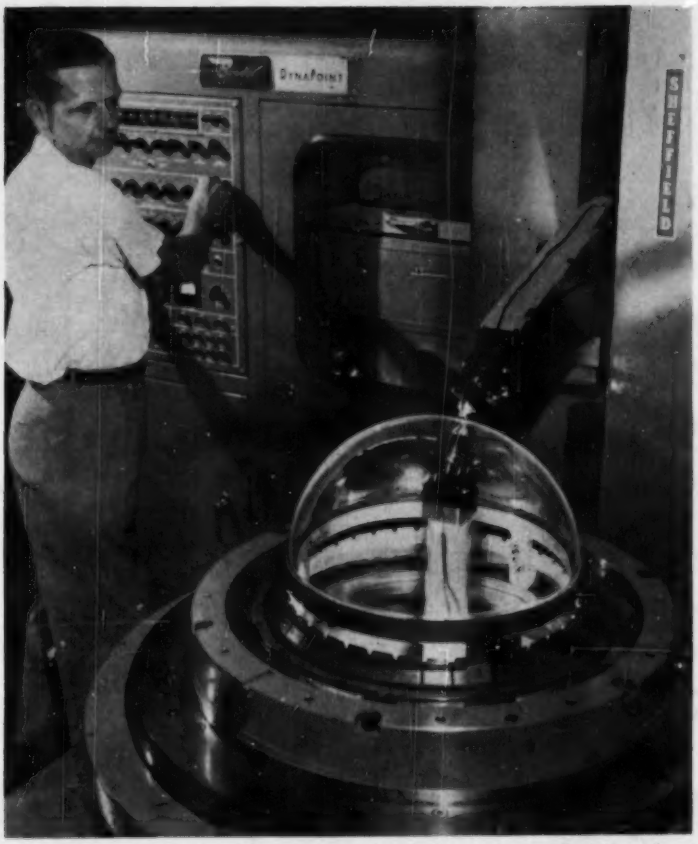
Describing shapes

The Autopromt language contains words that describe shapes and surfaces: cone, cylinder, hyperbolic paraboloid, and the like. Other words designate relationships between surfaces: angle, axis point, intersection of, surface point.

In practice the programmer describes with these words each surface of the shape to be machined, the relationship of each surface to the others, and such machining data as tolerances and tool size. This basic data, punched into cards, feeds into the computer.

Already stored in the computer is a set of more than 30,000 instructions. When the computer receives the Autopromt data, it translates them into computer codes, simulates the surfaces and boundaries to be milled, and then calculates the detailed tool-travel instructions.

After this processing, the computer edits its calculations to reflect the type of numerical-control equipment and machine tool that will do the job. The final output is a tape that contains complete instructions for the machine tool. •



Tape commands direct inside-outside gaging styli to measure deviations from nominal dimensions. System can detect deviations as small as 10-millionths of an inch, make 1000 measurements in only two hours

Tape control guides electronic gaging system

The electronic styli probing the transparent hemisphere above are business ends of a 16-ton inspection system that can make 1000 precise measurements in only two hours. Normally, this work might take a month to complete.

Key to this startling speed is the combination of numerical control and the latest electronic gaging equipment. Accuracy is equally impressive: Analyzing the inner and outer surfaces of such a critical component as a missile nose cone, the system can detect changes as small as 10 millionths of an inch.

Just announced by the Sheffield Corp (Dayton, Ohio), the system can measure the inside, the outside, and the thickness of parts of any shape—simultaneously. Controlled by a roll of punched tape, the gaging styli can be positioned at any point or angle to within 0.0001 in. in the gaging range of 20 inches in length and height. And accuracy of wall thickness is within 50 millionths of an inch (by way of contrast, a dollar bill is 80 times as thick).

Setup for measurement

The Sheffield system has these components: an 8-ton gage base with vertical and horizontal slides; a rotary table; a Bendix numerical-control unit; and a console that contains gaging and amplifying circuits, readout meters, and an automatic printout system. Mounted on the horizontal slide, the rotary table holds the workpiece; the vertical slides carry the gaging styli.

Controlled environment in the room that houses the system keeps the temperature constant.

In operation, the part to be measured rotates on the table, while the styli explore the inner and outer surfaces. These styli are Sheffield Electrojet gage cartridges that connect to electronic amplifiers. One cartridge contacts the work's inner surface, the other its outer.

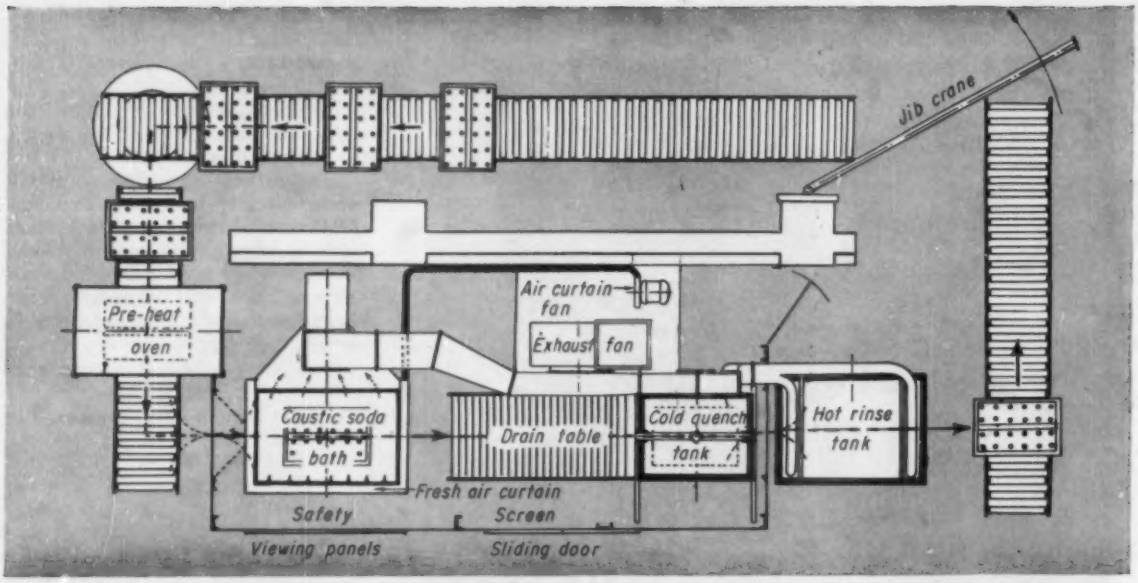
The part's nominal dimensions, coded on the punched tape, become command signals that position the workpiece slide and the vertical slides carrying the styli. Once the styli are in position for a given horizontal plane, the part rotates about its vertical axis, either in controlled steps or continuously. Deviations from the nominal dimensions are printed out and also indicated visually for various points on the plane. Measurement is so precise that 100,000 readings can be taken on a single inch of the part under inspection.

The positioning system

A Bendix Dyna Point-20 numerical-control unit translates tape codes into command signals that actuate the system's servo drives and monitor the machine's responses to commands. Five axes of controlled motion are supplied: The workpiece moves horizontally and also rotates, the outer gage stylus moves vertically and horizontally, and the inner stylus moves vertically.

Flexibility of gaging is an important feature of the system. To make the measuring instrument as universal as possible, designers provided three types of gaging:

- **Numerical-control scan gaging:** As the part slowly rotates under the tape control, any dimensional deviation that exceeds pre-set limits stops rotation, and the deviation is printed out. This setup provides automatic point-by-point inspection and recording on a plane.
- **Numerical - control increment gaging:** Here the tape - controlled table advances a pre-set amount, stops, and deviation and position are printed out.
- **Operator-control gaging:** Where a part of unknown dimensions has to be measured, the operator sets all conditions manually. The information obtained here then becomes the manuscript tape for reproducing the part. •



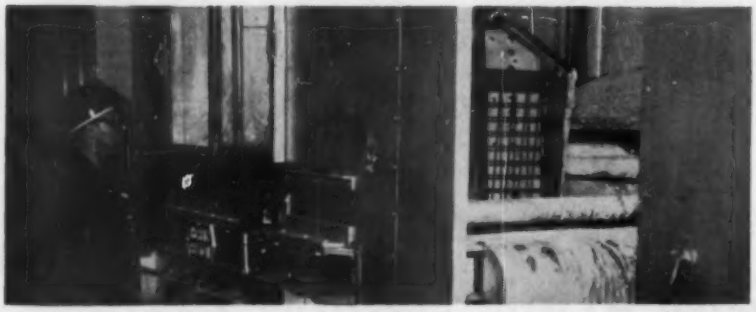
De-sanding installation is 38 ft long. All hazardous sections are enclosed to prevent risk of splashing

Molten caustic de-sands castings

Removal of sand from diesel cylinder head castings, long a problem at England's Leyland Motors Ltd, has been solved by leaching the sand grains out by immersion in molten sodium hydroxide (caustic soda) at 950 F.

De-sanding is done in a self-contained pickling plant which can handle about 70 tons of castings a week, and which, for safety, is housed in a separate building adjacent to the main cleaning bay.

The castings are degreased and shotblasted in the regular cleaning room, then loaded into wire baskets which hold about 830 lb of work.



Remote controls permit operator to lower work into molten caustic soda while watching through safety-glass window. Door, opened for photo, is normally closed

Castings must be dry

A roller conveyor carries the baskets into a preheat furnace, where they are held for 25 min at 270 to 300 F to make sure that the castings are perfectly dry. (Any moisture introduced into the molten salt bath would cause a violent explosion.) Preheating also reduces thermal shock in the melt, and prevents cooling the melt unduly.

Heated loads are picked up by hoist and passed through safety doors into the tank of molten caustic, where they are held for 25 min. After draining for 3 min over the tank, loads pass out through swinging doors, and onto a drain table for 20 min, where they cool to about 500 F to reduce the shock of the quench.

Quenching is done in a tank of cold running water, equipped with a lid that closes before the load reaches the water so as to prevent excessive splashing when any residual caustic reacts with the water.

Washing takes 10 min, during which the load is raised and lowered twice to flush out internal passages. This is followed by a hot water rinse for 15 min at 150 F, then by air drying on a roller conveyor.

The 1-inch welded-steel melt tank holds 3½ tons of caustic, and is surrounded by a curtain of moving air, which damps down spray and fumes until they reach the exhaust fan. Because sludge accumulation is considerable, twin trays are installed in the bottom of the tank and are removed at the end of each working day. Caustic loss amounts to about 44 lb per ton of work.

Safety precautions include complete screening of the melt, drain, and quench areas, and floors are covered with metal grills, so splashed liquids drain into a sump.

Operators wear protective helmets and goggles, and maintenance and sludge-removal personnel wear protective clothing, helmets and hoods. Supplies of buffered phosphate solution (the recognized antidote for caustic soda) are kept at hand, and operators are trained in first aid. •

Exploding the myths of explosive forming

Springback is still with us

"The metal moves so fast it doesn't know what's happening to it." This is one of the popular myths about explosive forming, but it's not exactly true. In most cases you'll get springback and some residual stresses, says Professor Erik K Hendriksen, senior project engineer, Aerojet-General Corp, Downey, California.

Speaking before some of the 1500 engineers (from U S, Germany, England, Japan, and Holland) at the 1961 Summer-Annual Meeting of the American Society of Mechanical Engineers earlier this month in Los Angeles, Prof Hendriksen pointed out that it's possible to have springback or residual stresses, but that the two generally occur together.

The residual stresses in explosive forming, however, are not as large as those developed by conventional forming means. Harmful residual stresses, for example, are usually so slight that stress relieving is seldom needed after explosive forming.

These stresses can be determined by analysis, provided principal strain curves for the formed part and the true-stress-strain curve for the material are available. Maximum stresses occur in flanges and similar portions where large variations in curvature. Maximum stresses found in the flanges of domes explosively formed from AISI 4335 steel were 25,000-30,000 psi. At equivalent areas in AISI 1020 domes, the stresses were 8,000-10,000 psi.

Recent applications

Recent progress in the use of explosives for high-energy-rate metalworking was discussed by Dr Louis Zernow, director of research, Ordnance Division, and Irving Lieberman, head, Explosives Application Department, Aerojet-General. They touched upon fabrication of refractory metals, compacting of powders, welding, and other processes. Some of the latest forming applications, for example, have come about because of the need for asymmetrical shapes that could not be produced by hot spinning.

Off-center and integral bosses on rocket chamber cones normally require three-dimensional machining, but can be produced quite easily by explosive forming. The requirement for non-uniform thickness in the dome of a rocket engine is another problem that yields to explosive forming techniques. Material thickness can be held within ±0.004 in. with normal explosive forming techniques; it is possible to maintain ±0.002 in. with proper surface preparation.

Explosive forging

When materials of substantial thickness are to be formed, the process can be more logically described as explosive forging. Often, explosive forging produces parts from heavy blanks in fewer steps than are required in conventional forging. And metallurgical properties are often improved at the same time.

Hot explosive forming has been found useful in working the materials that are hard to form because of their brittleness at room temperature. Heat can be applied by direct electrical resistance heating, radiation, induction, by contact with heated solid or liquid media, and in some cases, by means of a chemical reaction in the medium surrounding the workpiece.

Forming and welding Mg plate

Both press forming and welding of heavy magnesium plate were topics of particular interest because most work to date has been confined to thin sheet material.

R A Matuszeski and A J Kish, both of ACF Industries, Albuquerque, NM, described the practicality of press forming deep drawn shapes from 1½-in.-thick AZ31B magnesium alloy using a 900-ton hydraulic press. Because press forming of sections of this alloy over ¼ in. thick at room temperature presents metallurgical difficulties, the work was done at 600-650 F. Directional properties and accumulated internal stresses were reduced by heating between intermediate draws.

Forming temperatures of each subsequent stage were reduced 50 F. Several factors influenced the forming operations: composition and temper of the alloy, material thickness, degree of reduction and, of course, final configuration of the part.

Welding of these heavy sections is not common practice either, although considerable work has been done with sheet under ¼ in. thick. Matuszeski and Kish described MIG welding of the same magnesium alloy (AZ31B) in thicknesses of 1 in. and 5 in. Constant wire feeds of over 700 ipm for 1/16-in.-dia. wire were used, with the gas supply adjusted to furnish a 50-50 mixture of argon and helium.

Preheating at a nominal temperature of 300 F promoted fusion. The ultimate tensile strength and elongation, either across or along the weld, were equal to or exceeded those of the parent metal.

Machining nodular cast irons

Machinability of nodular cast irons was discussed by K Hitomi, assistant professor, Department of Mechanical Engineering, Kyoto University (Japan) and G L Thuering, professor, Department of Industrial Engineering, Pennsylvania State University. They reported on tests to determine tool forces required to machine three grades of nodular cast iron, as well as on the performance of several grades of carbide and oxide cutting tools.

Cutting characteristics of grades 80 and 100 nodular cast iron were found to be the same as for high-strength gray cast irons of similar hardness. Machining grade 60 with carbide tools resulted in a build-up on the flank of the cutting tool and sharp increases in tool forces.

Other tests on grade 60 material showed that a decrease in feed rate increases the critical cutting speed at which flank build-up occurs, and decreases the tool force generated by the build-up. The critical cutting speed and the increase in tool force at the start of the build-up are slightly lower for K4H than for K6 carbide.

Flank adhesion is encountered with both positive and negative rake tools, but critical cutting speed is higher and tool forces are lower for cutting tools with positive rake angles at feeds below 0.010 ipr. With K4H carbide, flank build-up does not occur at high cutting speeds nor does it occur when tools of positive rake are used at very low feed rates. Increasing the cutting tool clearance angle and use of a mist spray of soluble oil and water also reduced flank build-up. •

New gear classification system is in

With the new classification system for spur, helical, and herringbone gears now an accomplished fact, the American Gear Manufacturers Association has started work on the new inspection manual.

First draft of the proposed inspection manual was reviewed and discussed at the 45th Annual Meeting at Hot Springs, Va, early this month. Based on experience with the classification manual, several drafts will be required before all the diverse requirements and applications of gearing have been satisfied.

On May 20, AGMA rescinded all sections dealing with tolerances, classes, and backlash in AGMA 231.02 (coarse pitch) and 236.04 (fine pitch). These standards will continue to be used for inspection for the time being.

The rescinded sections are replaced by AGMA 390.01, Gear Classification Manual for Spur, Helical and Herringbone Gears. (Copies of the manual can be obtained for $1.50 from AGMA, 1 Thomas Circle, Washington 5, DC.)

Higher precision

In the old system there were three classes of coarse-pitch and three classes of fine-pitch gears. The new system recognizes the considerable increase in the precision requirements and in the methods of maintaining and measuring gear tolerances that are available.

In the new system a quality number indicating tolerances is combined with a material number indicating material, heat treatment, and hardness. For example, a Class 7-B-6 gear is one with a quality of 7 on the tolerance charts, made of aluminum bronze, and heat treated to a minimum hardness of 179 Bhn.

In coarse-pitch gears the quality numbers range from 3 to 15. A No. 3 gear, for example, 100-in. dia, 1 DP, will have a runout tolerance of 0.125 in. A No. 15 gear, 6-in. dia, 4 DP, will have a runout tolerance of 0.0005 in., pitch tolerance of 0.00015 in., profile tolerance of 0.0003 in., and lead tolerance (if the face width is less than 1 in.) of 0.00015 in.

A table included in the manual lists applications for coarse-pitch gears and suggests the quality numbers suitable for each of these applications.

Material and treatment designations, which follow the quality number, include a letter or letters and numbers. In general, higher numbers indicate higher hardness. Thus H-1 to H-6 represents a range of hardness in quenched and tempered carbon steel; H-11 to H-18 represents a similar range in alloy steel.

For fine-pitch gears, the quality numbers range from 5 to 16, but with closer tolerances in each quality bracket than for coarse-pitch gears. A backlash designation, A to E, is added to the quality number.

Material and treatment numbers for fine-pitch gears are essentially the same as for coarse pitch, but a different list of applications and suggested quality numbers is provided.

Seven inspection classes

For the proposed Inspection Manual, seven classes of inspection procedures are outlined at present:

Class A involves inspection of tooth thickness and runout.

Class B is Class A inspection plus pitch (tooth-to-tooth deviation).

Class C is Class B inspection plus involute profile.

Class D is Class C plus lead.

Class E covers tooth thickness and total composite tolerance.

Class F specifies a check of tooth thickness and total composite tolerance 100% plus a sample inspection of pitch, profile, and lead.

Class G will be added to include a check of angular position tolerance.

The man who headed the task committee for the Gear Classification Manual was Clarence R Burrell, president, Tool Steel Products Sales Corp, Cincinnati. During most of three years he headed the committee, Burrell was with Tool Steel Gear & Pinion.

That the scars of reaching agreement on the new classification system are not permanent was indicated by the selection of Mr Burrell to receive the 1961 Edward P Connell Award for outstanding personal contributions to the art of gearing. He was given the award both for his work on the classification manual and for his services as an industry representative to BDSA.

New officers

C F Bannan, vice president, Western Gear Corp, was installed as the new president of AGMA. New vice president of the products division is J Harper Jackson, sales manager, Jackson Gear Co. Folke Richardz of Westinghouse continues as vice president of the technical division.

Russell Ball, Jr, president of Philadelphia Gear Corp, was elected treasurer. New members of the Board of Directors are: Jack Borisch, Milwaukee Gear; Duncan Dorris, George P Dorris Co; Robert Honegger, Farrel-Birmingham Co; and Robert Smallwood, Dominion Engineering Works. •

AGMA's New President
Charles F Bannan
Vice President
Western Gear Corp

Connell Award Winner
Clarence R Burrell
President
Tool Steel Products Sales Corp

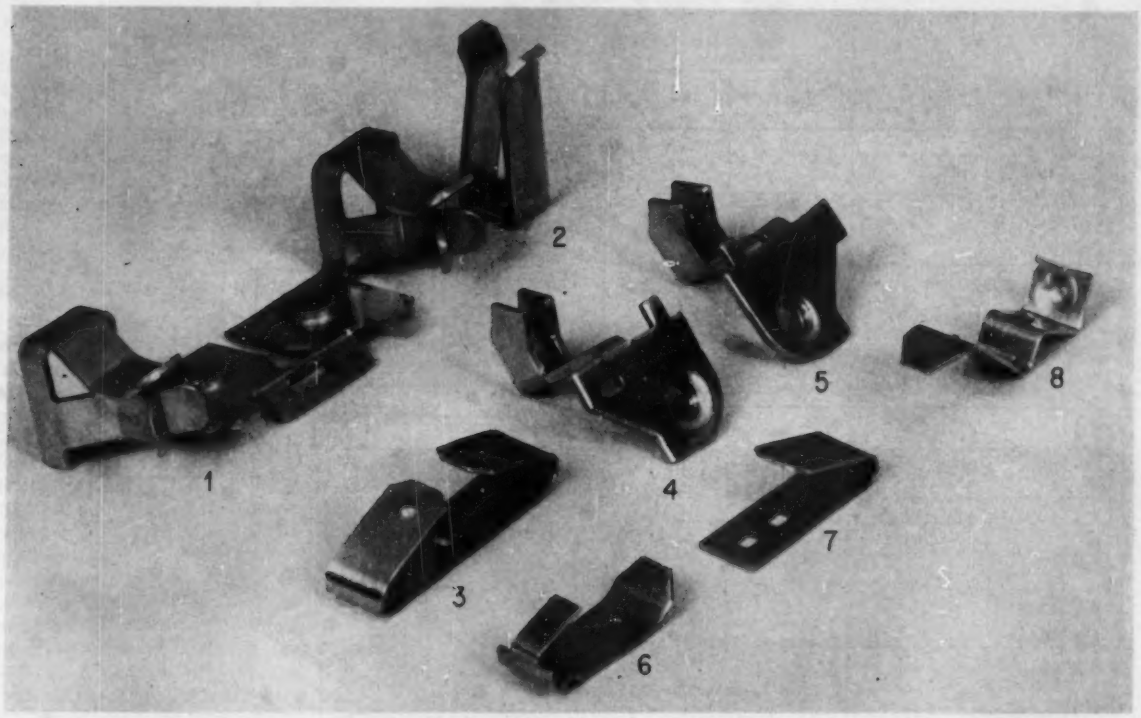


Fig. 1—Eight electrical contacts typify parts that can be punched and formed from strip both cheaper and faster on a four slide. Method avoids a second operation on part 1, saves 18% on part 3, 15% on parts 6 and 8, and 4% on part 7

Faster, cheaper than press forming

Strip-forming on a four-slide

Switch from presses to a four-slide machine has upped production rates, cut downtime for tool maintenance, eliminated excessive tooling costs . . . and the operator can time the forming slides himself

By **Paul Ricken**, chief tool engineer,
National Tool & Mfg Co
Kenilworth, N J

To firms supplying high-volume consumer markets, the economics of strip forming are critical. Yet a fundamental change in production method is not easy to make, even though inherent advantages are readily apparent. Sometimes, it takes a new job to jar a shop loose from the customary ways of doing things.

That was the case at National Tool, where until recently all strip parts were formed on standard presses. We knew that current-model presses would be somewhat faster, and we recognized the advantages of the four-slide machine for strip forming. But the pressure of rising tooling and production costs seemingly did not yet justify a reorientation of tooling and production concepts.

Reverse bends needed

The break came early in 1959. Production studies indicated excessive press tooling costs for spring contacts in a redesigned attachment plug. These seemingly simple parts (Nos. 6 and 8, Fig. 1) have reverse bends. To press form them would require a complicated system of cams and slides. At that point, our tool design group investigated the possible use of four-slide machines, and eventually we installed a Torrington V81 Verti-Slide machine.

Capacity absorbed

Within a few months we put eight jobs on the four-slide, thereby accounting for about 60% of the available time on the machine. The remaining capacity will be absorbed by parts now being tooled or under study. Cost savings range from a high of 18% to a low of 4%, depending upon the part. These savings are the result of faster output on forming jobs, lower cost of original tooling, and reduced tool maintenance.

The decision to produce a part on the four-slide machine or on presses is based primarily on the part's configuration. If the part is relatively

Strip-forming on a four-slide . . .

Part See oposite page	Pieces/Min	
	Press	4-Slide
1	New	120
2	New	220
3	60	180
4	100	140
5	100	140
6	New	200
7	120	200
8	New	200

Fig. 2—By developing four-slide tooling for four new parts and four existing parts, 60% of the productive time of the four-slide was absorbed in a few months. Each part is made in a continuous run to suit a 6-month sales forecast

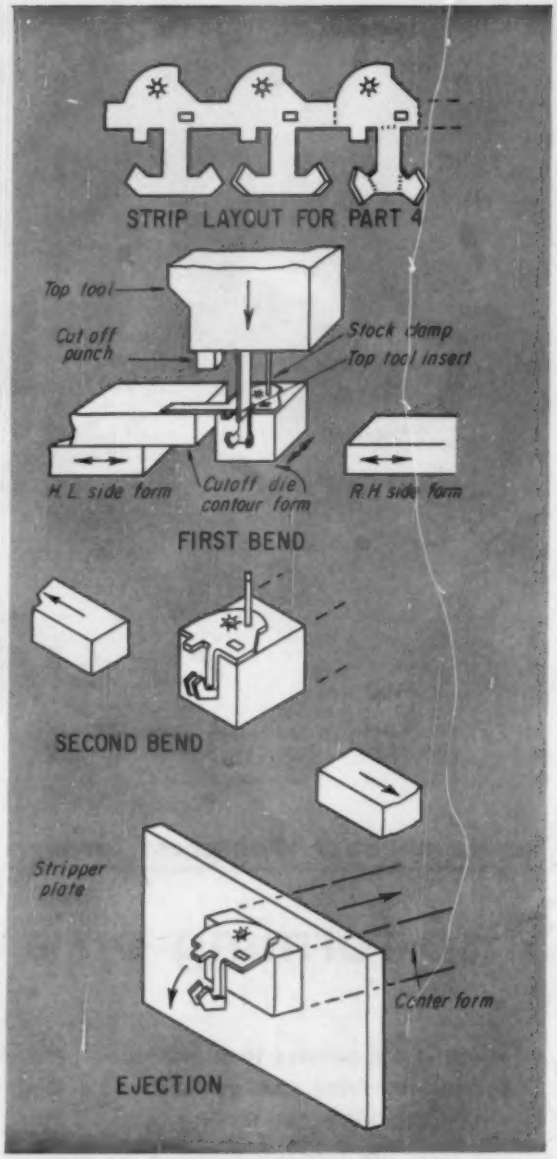


Fig. 3—Five tools are used at the forming station to complete the 90° bend on the inverted T and set the ears parallel (Part 4, Fig. 2). As the tools open, the center form retracts to eject the finished part

complicated and a lot of forming is clearly involved, it is probably more economical to produce on the four-slide machine. A reverse bend, for example, in an otherwise simple part, alone affords a substantial cost advantage in four-slide forming. On the other hand, if a good deal of straight blanking is called for, the part is usually produced more economically in a press.

Dimensional control

Two similar switch contacts (right-hand and left-hand) were the next parts to be formed on the vertical four-slide machine. These two parts (Nos. 4 and 5, Fig. 2) are used in single-pole and three-way wall switches.

The primary forming problem involves maintaining proper spacing and parallelism between the twin contact tabs. When these parts were produced on power presses, a secondary manual operation was required to size and parallel the two tab contact surfaces. Even then, there was some difficulty in meeting the production tolerances of ±0.005 in. on the width of the tab opening and ±0.003 in. on parallelism of the contact surfaces.

By producing these switch parts on the vertical four-slide machine instead, the secondary operation was eliminated. The reduction in stamping cost was substantial, because the secondary operation had cost eight times as much as primary forming.

The visibility and accessibility of the forming area and the various components of the Verti-Slide are the reasons why the supervisor can make needed adjustments without

calling in a toolmaker. For example, he might be required to adjust a center-form assembly at the rear of the machine. A handwheel, which is engaged with the camshaft, is turned until the pointer on a 360° calibrated disk indicates the desired cam angle. This simple task is typical of the adjustments required.

Service problems

Our experience with the double-spring contact (part 3, Fig. 2) will illustrate the cost of tooling and maintenance when a part like this is made on a press or a four-slide. The cam dies cost more than four-slide tooling, but take only an hour to set up.

Original setup in the four slide takes three hours, because the center form and different slides and cams must be adjusted. However, servicing the cam die takes about 6 to 10 hr per week of a diemaker's time, whereas a four-slide operator can make his own adjustments. Net costs for setup and servicing the four-slide on formed work such as we make are lower.

Complicated job

A considerable number of operations can be combined in a four-slide setup. Our machine has two "press sections." These two sections punch, blank, pierce and partially form the double-receptacle contact (part 1, Fig. 2 and also Fig. 4) as the stock is advanced to the forming station. For this job, 0.032 x 0.688 in. brass strip is employed. When the strip enters the forming area, the center section has one edge of the center section bent up, and the tips of the contact fingers are formed down. Operations in the forming area, therefore, consist of making three bends per side on the part, to set the contact fingers into position.

The outer finger now faces inward, the center one faces upward, and the inner one faces outward, to produce a three-sided "box." These fingers must also meet close tolerances for parallelism and position.

Versatility in forming

At the forming station, the upper and lower tools can move up and down in timed relationships (as in Figs. 5 and 6) and the center form moves in and out. Additionally, side-forming slides can be employed (Fig. 3). Therefore, forming on a four-slide machine is perhaps limited only by the tool designer's ingenuity. •

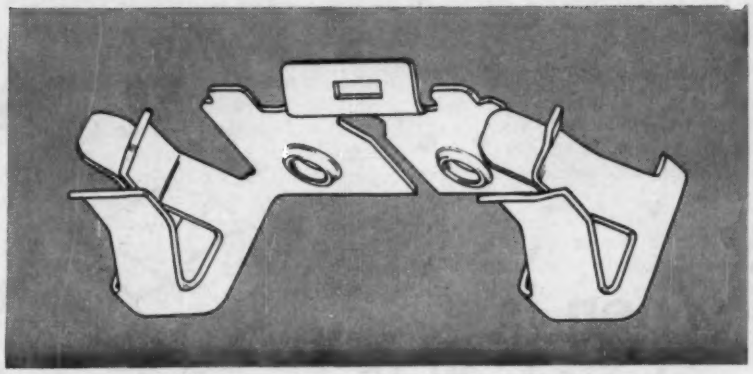


Fig. 4—Three fingers make up each contact of this double contact for a wall receptacle. (See Part 1, Fig. 1)

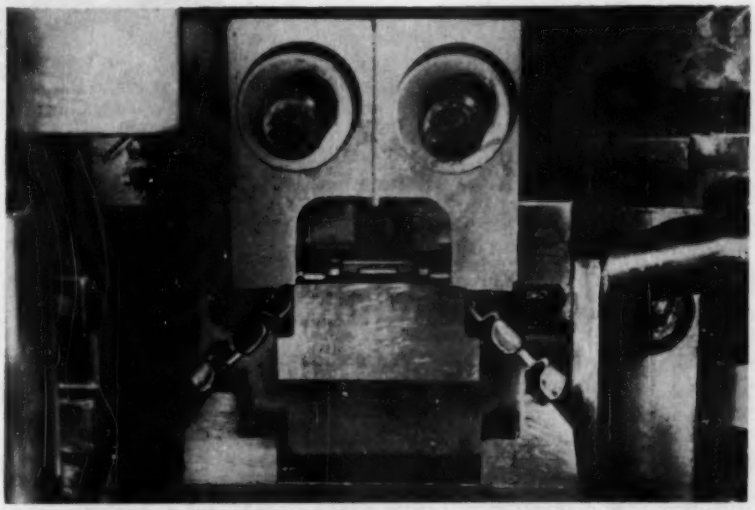


Fig. 5—After the punched and partially formed strip is located on the form block, and the stock clamp grips it, a cut-off die at left separates the blank. Next, the top tool starts to bend the side sections over the form block

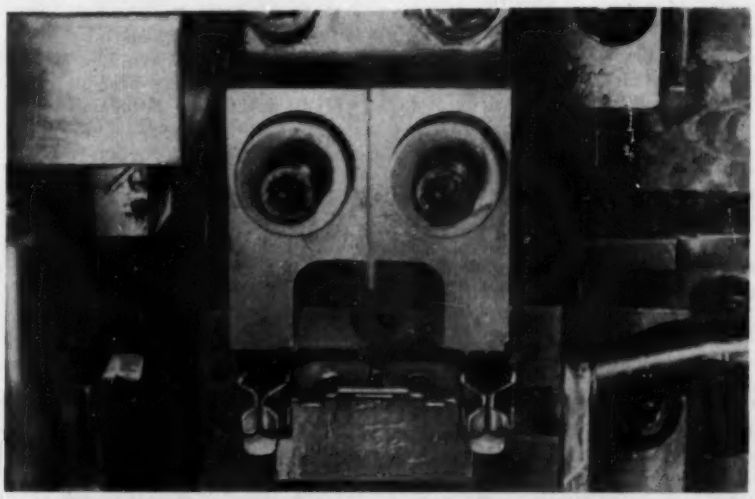
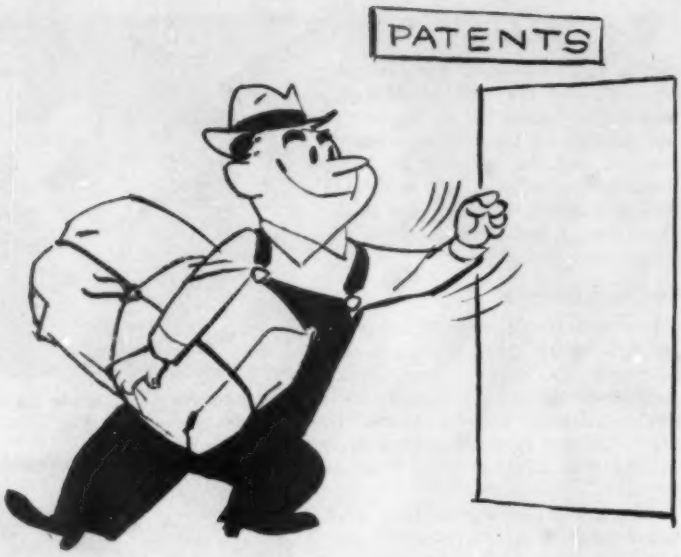


Fig. 6—By the time the upper punch bottoms, it has bent the inner finger downward 90° while holding the center finger flat, and has bent the outer finger upward at an angle of 90°. In this view, the top and bottom tools are withdrawing and the form block is retracting to eject the finished part



When is a patent valid?

By Albert Woodruff Gray

Patents on file today run perhaps into the millions, and chances are that almost any new patent application is somehow based on an existing patent, or even violates it. Here, a veteran patent attorney explains the criteria by which the courts determine the validity of a patent

What essential features must a product have, before it can be patented? Just how "original" must inventions be? When do courts rule that patents are invalid?

These are questions that every company should investigate—before and after it obtains patents on its processes or products. Here, going back as far as 1883, are court rulings.

The following case came before the court only two years ago:

A company had developed a process for recoring short lengths of preformed cable. Sometime after it received a patent, the firm brought suit against two employees, charging patent infringement. But the defense argued that the invention claimed in this recoring process had been anticipated by a previous invention. Thus, the defense persisted, the company should never have been granted a patent.

"Invention is perhaps the most essential element of patentability," said the court (ruling that the patent *was* valid). "It is the quality which carries a device beyond that level which might be obtained by the exercise of no more than mechanical skill and raises it to the legal stature of patentability.

"The concept embodied in this patent has been long and carefully considered. Such study has convinced the court that, obvious as it appears at this stage of the proceedings, the development of this patent did in fact require the exercise of inventiveness rather than mechanical skill only, and so properly forms a valid basis for a subsisting patent."[1]

As authority for its ruling that the patent was valid, the court referred to a summary once made by the U S Supreme Court. Here the Court stated the underlying theory:

"It [a patentable discovery] is the result of an inventive act, the birth of an idea and its reduction to practice; the product of original thought; a concept demonstrated to be true by practical application or embodiment in tangible form."[3]

Essential features

The patent statute, as amended in 1952, spells out the three essential features of a valid patent: *invention, novelty, and utility.* "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."[3]

These three vital features spelled out in this section establish the ground—the only ground—on which a valid patent can rest: invention, novelty, and utility. Actually this summary follows that laid down long ago by the Supreme court. Here is this historical statement, made when the Court held that a dredgeboat patent, granted shortly after the Civil War, was invalid:

"The process of development in manufactures creates a constant demand for new appliances, which the skill of ordinary head-workmen and engineers is generally adequate to devise and which, indeed, are the natural and proper outgrowth of such development. Each step forward prepares the way for the next.

"To grant a single party a monopoly for each slight advance made, except where the exercise of invention somewhat above ordinary mechanical or engineering skill is definitely shown, is unjust in principle and injurious in its consequences."[4]

Invention essential

The first of the three essentials for a valid patent, invention, was featured in a case that came before the Federal Court of Appeals during World War II. Some time before this, a patent had been granted for "expanded metal, a method and apparatus for manufacturing the same." In this process, a series of slits first was made with knives in a sheet of metal; then the sheet was stretched, expanding the metal.

The court dismissed infringement action brought by the patent owner

against another company, ruling that the patent owner had failed to qualify under the patent statute's concept of invention. What the court said, in other words, was that the patent owner should never have received a patent on his invention.

"Though it be elementary to say at this late date in the development of the patent law, it is necessary to recall that three elements are necessary to vailidity, to wit: novelty, utility, and invention." The court added these further comments: "Much difficulty has of course been experienced by the courts in determining what improvements lie within the expected skill of the art. Older cases are not very helpful. The patent law is presently in a state of flux.

"We cannot ignore the fact that the Supreme Court, whose word is final, has for a decade or more shown an increasing disposition to raise the standard of originality necessary for a patent."(5)

What is invention?

Actually, the definitions of inventions that the courts have made over the years have fluctuated widely. There has been no rule that even approaches mathematical accuracy.

Some years ago a company was granted a patent for a cigar lighter, which it had adapted for use in automobiles. Later it brought an infringement action against another company that made a similar product. But the court refused to hold that the patent owner's "invention" met patent-law requirements. Here is the ruling, made by a Federal District court:

"I have little doubt that the inventor who first succeeded in applying a bimetallic circuit breaker to a portable electric device made the contribution of a true inventor to society. But after the bimetallic circuit breaker had been introduced into a variety of electrical appliances such as flatirons, coffee pots, etc, and after the electrical cigar lighter had progressed through the reel stage to the wireless type of plug-and-socket device, and the wireless type had progressed from the open-face to the inverted-face type, and the inverted-face type had acquired semi-automatic features which hold the plug in open-circuit position in the absence of a manual pressure, the room for future invention in this class of electric lighter was strictly limited."(6)

Less than a year later, the appellate court set aside this decision, ruling that the lighter *did* fulfill the "invention" requirement of the patent law. "It is the conception that counts, the act of imagination which assembles the elements into the new and fruitful combination, not the working out of details.

"It would be absurd to rate this as a major invention, yet it did bring to what appears to be its final form, a contrivance which has become a standard fixture in motor cars, and upon every detail of this as much human ingenuity has been expended as perhaps on any machine."(7)

Still later that year, this second decision came (for review on appeal) before the US Supreme Court. The highest court made these remarks on invention:

"Under the statute the device must not only be new and useful, it must also be an 'invention' or 'discovery.' If the improvement is to obtain the privileged position of a patent, more ingenuity must be involved than the work of a mechanic skilled in the art. Perfection of workmanship, however much it may increase the convenience, extent, and use, or diminish expense, is not patentable.

"That is to say, the new device, however useful it may be, must reveal the flash of creative genius, not merely the skill of the calling. If it fails, it has not established its right to a private grant on the public domain."(8)

But not even this "flash of genius" qualification of the Supreme Court is enough. This oft-defined word still roams a maverick through the courts. Two years after this decision, the defense in a case before the Federal courts claimed that an apparatus for casting feed screws lacked this flash of genius in its conception. Agreeing, the court then proceeded to disagree with the Supreme Court, adding further nuances to the definition of invention:

"The test of a flash of genius should be rejected, not only because it is incapable of acceptable definition, but because it injects into the statute something not appearing therein. The Federal decisions covering a century contain many to the effect that it is the fact of accomplishment—novelty appearing—rather than the method of accomplishment with which judicial inquiry is concerned.

"The questions for the court are: what is the new product? what advance does it show over those in use or known to the art? . . . [In passing the patent statute] Congress was interested in protecting the product of the mind—not in whether it came as a flash of genius or as a happy thought or by long painstaking search and experimentation."(9)

Utility and novelty

Not many years ago, in holding that patents of coin detectors were valid and subject to court protection, a Federal appellate court made these comments on the two other features that make a patent valid:

"As to utility, it may be said that the invention was of small coverage and even smaller importance. If the coil selector made possible the rejection of underweighted coins or served better to eject such coins, it possessed utility. It is not the extent of the utility that governs, but the existence of some utility."

Of the feature of novelty in the statute, the court added: "Likewise as to novelty, the improvements or change may evidence no outstanding or revolutionary difference in mechanism. No giant's stride is demanded. Novelty involves the presence of some element or the new position of an old element in a combination different from anything found in any prior structure.

"There must be novelty; there must be utility. The statute exacts nothing more. The courts, however, have long recognized that there must be something present which modifies the kind of quality of the novelty. They have long, if not always, required that there be something in the originality, something about the novelty which makes the 'new' in the mechanism, something to cause the court to say, 'Here the inventor labored.' "(10)

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(8) Cuno Corp vs Automatic Devices Corp, 314 US 84, November 16, 1941
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(10) National Slug Rejectors vs ABT Mfg Corp, 164 Fed 2d 333, Illinois, October 17, 1947

Everything needed to plate almost anything is in this group of Dalic solutions, plating tools of various sizes and shapes, and the special power pack

Tankless plating gets a new job

Once confined to lowly repair and salvage jobs, brush plating has come into its own in recent years as a production method. Reason: it produces a durable coat on parts that are impractical to plate by bath methods

By Dr Cloyd A Snavely,
general manager
Sifco Metachemical Inc, Cleveland

Tankless (brush) plating, once assigned the job of repairing damaged or defective electroplate, has in recent years become a production method with many advantages over conventional bath plating.

Boosted out of the repair class by introduction of the Dalic process (*AM/MM*—Oct 7 '57, p116), tankless plating can now build up a coating of virtually any electrodepositable metal to any desired thickness. Not only that, hardness and adhesion are equal to, or better than those obtained by bath plating.

Prime advantages are low cost, high speed, and a remarkable flexibility—especially in those applications which require plating of only certain areas, and which would require extensive masking if bath plating were used.

And tankless plating has come into its own in plating with precious metals. Only a few ounces of solution are required, as opposed to many gallons of solution for a standard bath. It also eliminates the need for maintaining tanks of plating fluid. Solutions may be stored in small glass bottles on a single shelf in any convenient plant area without the need for a special plating room.

When first introduced, tankless plating was assigned its role as a repairing process simply because the range of materials it could plate and the thickness of deposit were so limited as to be of little commercial value.

Then came the Dalic process which consists essentially of swabbing the cleaned work surface with solution while power is applied from a d-c unit.

The swab is attached to the end of a special plating tool which is the anode of the circuit, (the work is the cathode). Ordinary cotton wool serves as the swab material, although this may be covered with chamois or synthetic fabric for wear protection if considerable time and temperature are involved. Synthetic fibers are usually unsuitable, because they tend to soften when temperature increases, and contaminate the solution.

Simple plating tools

The plating tool consists of a plastic-coated aluminum handle carrying a graphite electrode, or anode, around which the swab is wrapped. For larger-scale work, the tool has provisions for water cooling—to prevent the solution from boiling and to maintain its strength.

Air-cooled models carry up to 25 amp; common water-cooled models up to 100 amp. Larger units are provided for special purposes, such as plating large shafts for electrical equipment.

Required voltage varies from 4 to 35 volts. Although a standard d-c rectifier can be used, it is better to make use of a specially designed unit which includes a grounding device (to prevent accidents in case of insulation breakdown), and a fast cut-out (to prevent arcing, should the swab become so worn that a direct short occurs between the anode and the cathode). Recommended units also incorporate a special meter graduated in 0.01 amp-hr increments, by which the thickness of coating may be accurately controlled.

Because the amount of solution the swab can hold is quite limited, and because the rate of metal deposition is so high, the electrolyte quickly becomes exhausted of its metal content. To insure constant rate of deposition, a continuous feed is often incorporated, either from the tool handle, or from a glass bottle and hose.

For manual operation, a certain degree of operator skill is required because the movement of the swab over the work is fairly rapid (as shown in the accompanying table) and should be continuous.

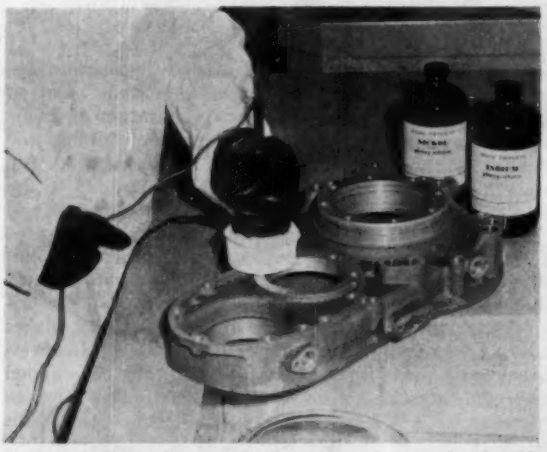
Holding the swab stationary produces a burned deposit which may be masked by subsequent passes, but which may cause peeling in service. On flat surfaces, a circular movement is preferred, so as to prevent irregular deposits. The swab should

Relative Speed of Movement of Plating Tool for Various Solutions

Solution	Speed, fpm	Solution	Speed, fpm
Bi	30 — 50	Pb	30 — 50
Cd (acid)	30 — 120	Ni (acid)	20 — 50
Cd (alk)	20 — 80	Ni (alk)	20 — 80
Cr	4 — 6	Ni (black)	10 — 15
Co	10 — 15	Pt	5 — 10
Cu (acid)	30 — 100	Rh	5 — 10
Cu (alk)	40 — 60	Ag	20 — 60
Au	30 — 60	Sn (acid)	30 — 120
In	30 — 60	Sn (alk)	20 — 80
Fe	20 — 40	Zn	30 — 120

Speeds given above should not be exceeded if optimum results are to be obtained. Some little skill is required, but an intelligent operator soon learns

Precision sizing of a journal with lead and tin for accurate fitting and prevention of fretting corrosion. Water-cooled tool is held by hand, work is chucked.



Intricate joint surface of aluminum casting is plated with indium to form a gasket, using the flat end of a large-dia plating tool

Commutator bars of high-performance aircraft motors and generators are Dalic plated with rhodium for wear resistance and to reduce radio interference

be rotated to even out the wear.

Coat after coat may be applied until the desired thickness has been built up, and this can be controlled to within 0.0001 in. There is no layering, and properly applied deposits are fine-grained, nonporous, and extremely adherent.

When cadmium plate is applied to steel under recommended conditions, for example, the first layer acts as a barrier to penetration of hydrogen, thus avoiding hydrogen embrittlement. With the exception of chromium, hardness of the deposits is greater than that obtainable by conventional plating procedures.

Surface preparation

As with any plating process, the surface of the work must be absolutely clean, and conventional anodic cleaning with alkaline solutions is satisfactory for most materials. Improper cleaning shows up immediately, as deposition occurs in a patchy manner.

For stainless steel and aluminum, an etching solution should be employed, or the surface should be scoured with powdered pumice or aluminum oxide so as to permit direct deposition of nickel or copper.

Even more reliable is vapor blasting with a fine abrasive. With such equipment, however, it is important that the abrasive itself not be contaminated by materials used in construction of the equipment.

A British-made machine, the Hydrotron, is well suited to this work, because it has a plastic blast chamber that prevents contamination of the blasting medium by iron or nickel, either of which causes immediate reoxidation of the cleaned surface.

When this equipment is used, plating is started within the chamber, so that there is no time lag between cleaning and plating. After a coating 0.0001 in. thick has been deposited, the work may be removed from the chamber and the build-up continued in the open.

Production applications

One of the more obvious production jobs for tankless plating is application of copper for carburizing stopoff. In the case of a gear, for example, in which only the bore is to remain soft, conventional methods

require that the work be plated all over, and then the copper stripped off, except in the bore.

Otherwise, extensive masking with tape and wax must be performed. The former results in considerable waste of copper, plus the machine time for removing it; the latter wastes a tremendous amount of time, plus the cost of the maskants.

With tankless plating, parts can be degreased and delivered to the plating setup right on the production line. There are no serious handling problems, because cleanliness is important in the bore only. Other surfaces can be handled freely. The plating arrangements may consist of an old lathe, geared down to slow rotation, with a cotton swab mounted on a suitable holder in the chuck.

A constant feed supplies the particular Dalic solution to the swab. The operator picks up a gear and positions it over the swab, moving it slowly back and forth until the desired thickness is obtained. No problems are encountered in getting the proper thickness, because deposition is a function of time and amperage. Thus the operator need only keep an eye on the meter.

Stop-off plating

For pack or salt-bath carburizing, 0.0002 to 0.0005 in. of copper is usually adequate and is plated from an alkaline solution. For heavy gas carburizing, 0.001 to 0.002 in. are usually required. If an acid copper solution is used, a nickel strike of 0.000025 in. should precede the copper. This is so thin that it does not usually have to be removed after the copper has been stripped.

For nitriding, tin is commonly employed as a stopoff, and may be from 0.0002 to 0.005 in. thick. With some metals there may be trouble with pitting, but this can be avoided by using an intermediate nickel flash coat. If the high temperature causes the tin to flow, copper can be applied first, followed by 0.0001 to 0.002 in. of tin.

Frequently, it is more convenient to chuck the work and hold the plating tool by hand, particularly when layers of different metals are to be deposited and several tools are needed. This also avoids the necessity of arranging a continuous solution feed, as the plating tool can be dipped in a dish of solution.

Plating to size

Selective fitting of anti-friction bearings—a tedious and time-consuming job—can often be avoided by tankless plating. Standard bearings are usually made to a 0.0005-in. tolerance, but when precision fitting is required, a tolerance of 0.0002 in. is often specified. Usual practice is to machine the housing to a 0.0005-in. tolerance and selectivity fit the bearings until the required tolerance is obtained.

This problem can be avoided by building up the housing with copper, tin, or silver until the proper fit is obtained with a standard bearing. The plating has the additional advantage of acting as a cushion to prevent galling and fretting corrosion. Fits controlled to better than 0.0001 in. can be obtained with a little experience in the method.

Silver plating is frequently required in electrical work, particularly on circuit breakers, and it has always been a problem to deposit the silver on just the contact areas without masking or plating the entire part. This is now being done quickly and economically by applying the required depth of silver with a small hand-held plating tool and Dalic solution. On printed circuits, also, conductivity is increased and wear resistance improved on contact fingers by plating with nickel, followed by rhodium.

One company plates small circuit-breaker contacts with gold and rhodium on a continuously moving conveyor. As the work passes in front of the first group of operators, the contacts are electrocleaned with a regular plating tool and alkali cleaning solution, using reverse current. Parts are then spray rinsed, plated with gold and rhodium, rinsed, and dried.

In another unusual application, minute amounts of metal are added to selected areas of high-precision parts to insure dynamic balance.

Transistor applications

Tabs on transistors are plated with alloys of tin, lead, bismuth, gallium, or indium on a 3/16-in.-dia ring which has a hole through the center that must not be contaminated with solder. Parts are mounted in a special jig, using a magnifying glass and vacuum probe. The jig holds 81 parts and is equipped with air-operated pins which enter the center holes to act as a mask. Air pressure prevents the solution from seeping down between the work and the jig.

The loaded jig is placed on an oscillating table, which moves it sideways and back and forth. The plating tool indexes slowly as the work is rubbed against it and is supplied with plating solution by a continuous feed. After plating and rinsing, parts are examined under a microscope while still in the jig, and defective ones are removed with tweezers.

Another production operation involves large aluminum assemblies which are fastened together in the field by steel pins. Considerable wear can occur on the aluminum because of continual friction with the steel pins. But today holes in the aluminum are Dalic plated with nickel for wear resistance in service, and with zinc for corrosion resistance during storage and shipment.

The hardness of the nickel provides wear resistance comparable to hardened steel in this type of application. The zinc coating probably serves as a lubricant in addition to its role in corrosion protection.

New applications

A number of new production applications are under study. One of these involves preparation of high-strength stainless steel tubing and fittings for field brazing. A thin coating of Dalic gold applied to the exterior surface of the tube end, and the interior surface of the fitting prevents oxidation and other contamination of these surfaces which must be wet by the braze metal. For in-shop assembly, a coating of nickel serves the same purpose. However, where the parts are to be shipped or must undergo extended storage before brazing, the gold coating helps insure successful brazing.

Another new and increasingly important application involves plating of refractory or unusual metals, which are difficult to plate by conventional techniques. Adherent plated coatings are readily applied to tantalum, molybdenum and tungsten. Semiconductor devices of metals such as tantalum often require a coating of nickel or tin. By proper racking of these small parts, a production operation allows an operator to plate from 25 to 1000 parts in a few minutes with a low reject rate.

The Dalic process also allows direct plating on aluminum without intermediate dips (such as zincate of other immersion processes). Thus, the process is adaptable to automated plating of portions of aluminum conductors which are to be soldered or clamped for low electrical resistance in the joint. Nickel, cadmium, or zinc can be used in this application. The electroplate is applied only where needed. •

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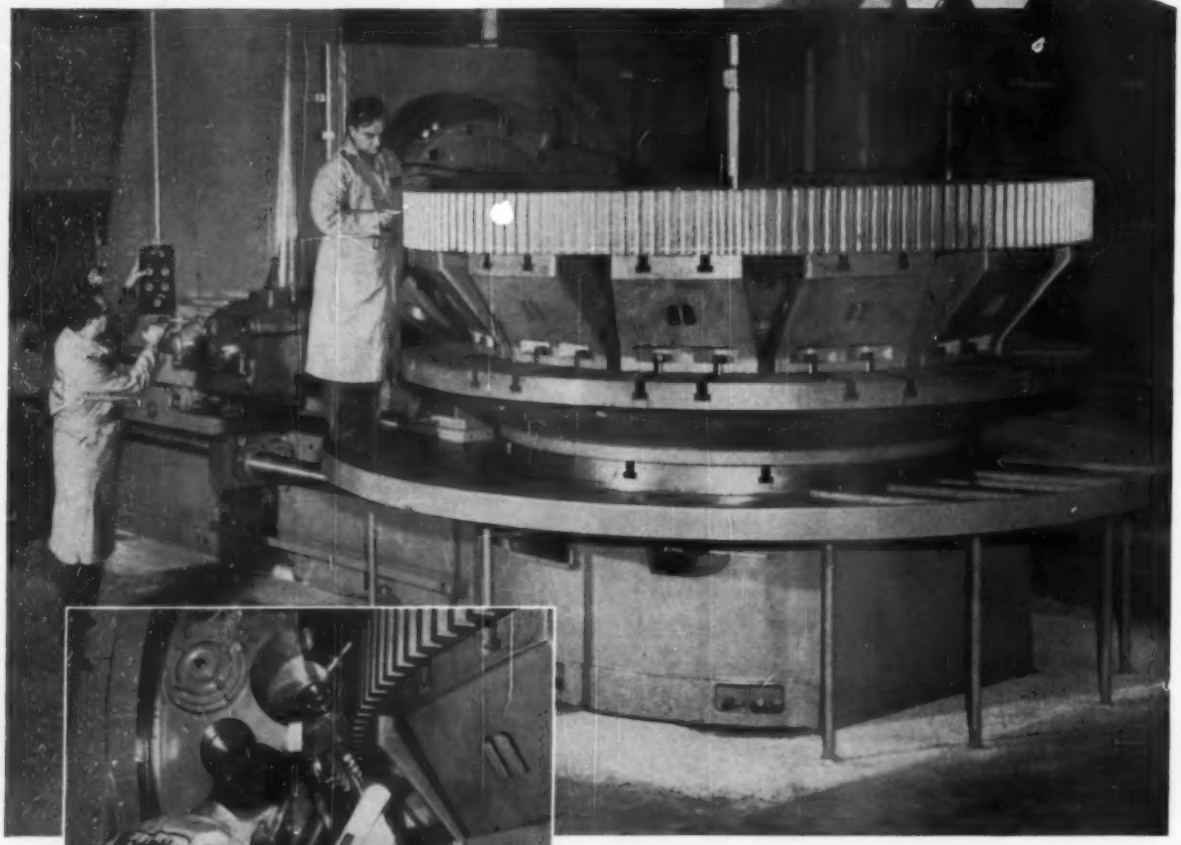
Carborundum® sandpaper sheets, belts, discs and Economy® Rolls are deliberately designed to pay real dividends in small-job sanding—for all hand applications, and portable or bench machine work. They cut faster and finish more uniformly, because they are made under the same rigid controls, and from the same fine abrasive materials, as the most technical coated abrasive products. Their cost is small—but the savings they bring can substantially reduce your overall expense.

Give your Carborundum distributor a few minutes to show how Carborundum quality—backed by his own abrasive knowledge and service—can help you.

CARBORUNDUM

"Had to have extremely close tolerances...so I called Phillie Gear"



Phillie Gear's new hobber at work . . . will handle gears up to 165" dia., 64" face width.

Looking for commercial gearing, cut to exceptionally close tolerances . . . at no increase in cost? Then give us a call. We are equipped better than ever before to meet your needs with the highest quality commercial gearing available today.

This new hobber, the latest addition to our new and expanded facilities, is the machine that can turn out the big ones. It is the most rugged, precise gear hobber we've ever seen. It was custom built to our rigid specifications. Accuracy is certified to ten arc seconds.

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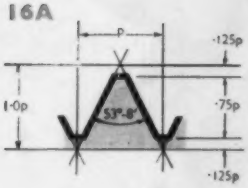
King of Prussia (Suburban Philadelphia), Pennsylvania

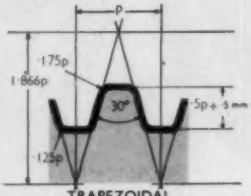
World Screw-Thread Forms—II

16A



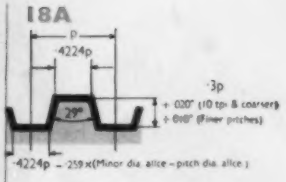
LOWENHERZ

17A



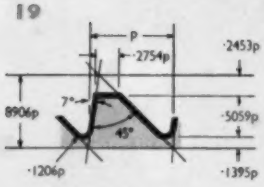
TRAPEZOIDAL
(Locomotive)

18A



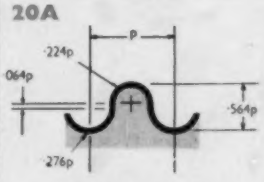
American Standard
STUB ACME

19



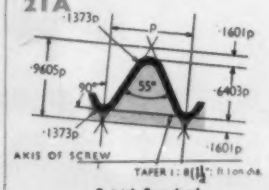
British Standard
BUTTRESS

20A



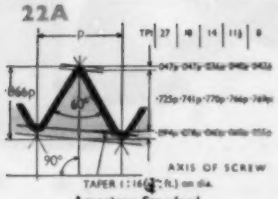
British Standard
ROUND for Fire Hose

21A



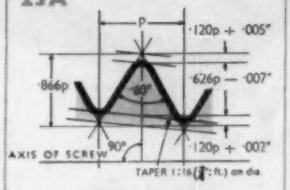
British Standard
GAS CYLINDER

22A



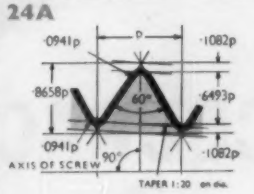
American Standard
PIPE TAPER DRYSEAL

23A



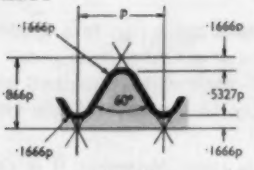
A.P.I. ROUND FORM

24A



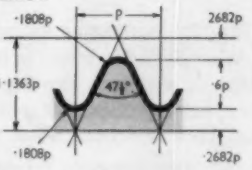
METRIC FINE TAPER

25A



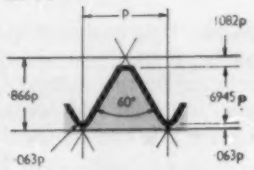
British Standard
CYCLE

26A



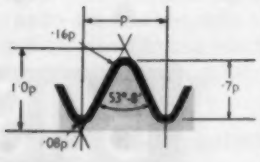
B.A. (British Association)

27A



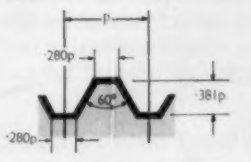
METRIC (S.I.)

28A



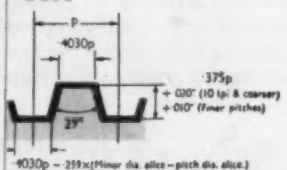
PUTEAUX

29A

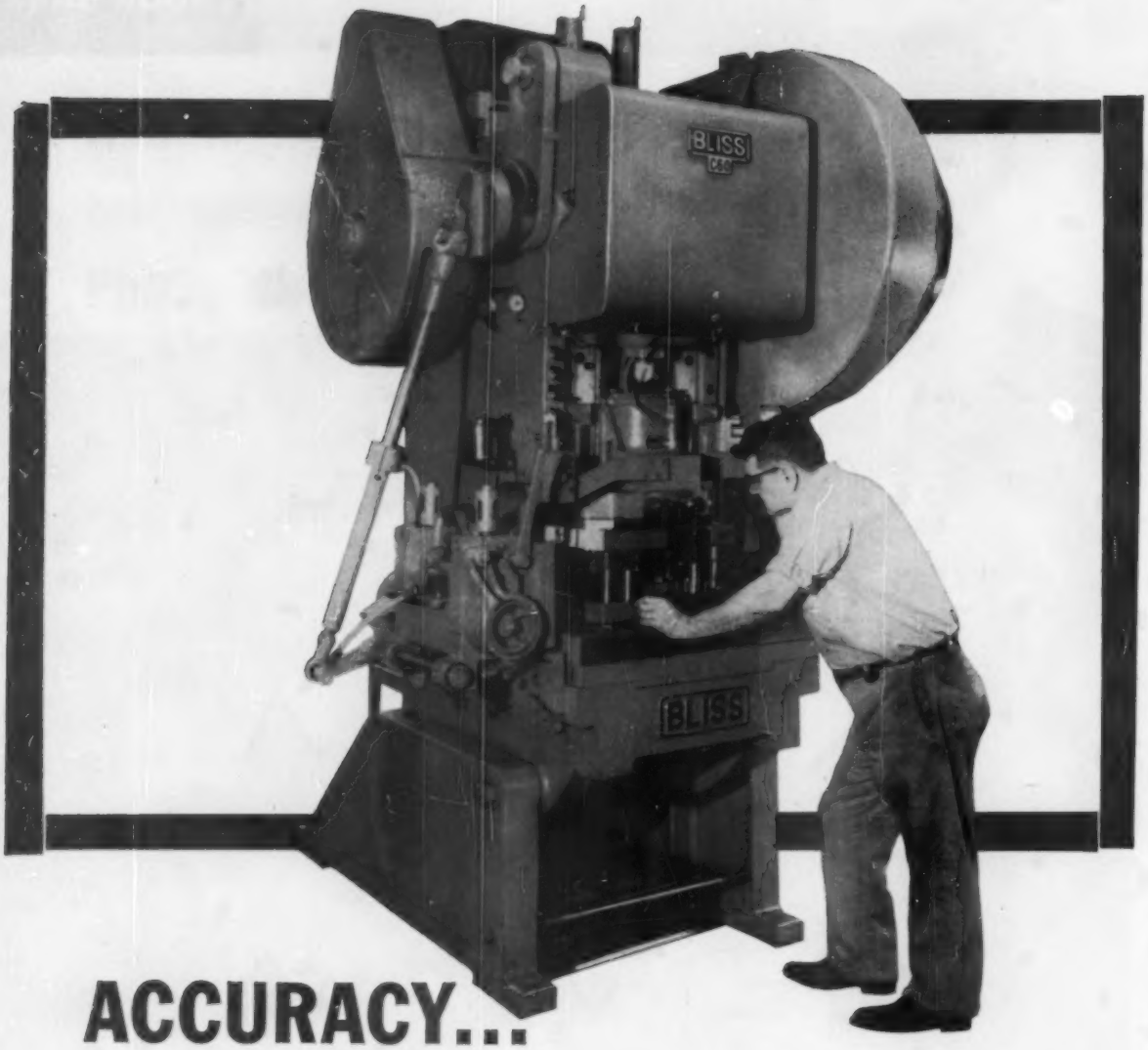


American
BRASS VALVE STEM

30A



American Modified
STUB ACME Form 1



ACCURACY...

that pays off in longer die life, longer press runs before regrinds, with new Bliss Big "C's" and new Bliss "swing-out" portable feeds

The extremely rigid design of Bliss Big "C" inclinables keeps frame deflection to a minimum, even when running at maximum tonnages. What does this mean in terms of actual performance? . . . At Oak Manufacturing Company, Crystal Lake, Ill., eighteen new Big "C" inclinables, equipped with special new Bliss "swing-out" roll feeds, have cut rejection rates sharply. In the case of one very difficult stamping, the rate has improved from 10% rejections down to 1%!

The new Bliss feed is far more accurate than the ones previously used. Moreover, it is designed to swing out away from the press during hand feeding, and can be readily transferred from press to press, regardless of the tonnage (Oak's new Big "C" presses range from 22-ton to 60-ton capacities).

The quality of Bliss Big "C" presses is spelled out both in their strength and, above all, in the precision of their construction, including nearly perfect parallelism between slide and bed, the close tolerances of all working parts, and in the high quality of material in the castings and forgings. Want more facts? Write us now for a complimentary copy of our detailed, full-color catalog.

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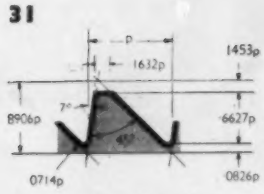
PRESSES • ROLLING MILLS • ROLLS • CONTAINER MACHINERY • CONTRACT MFG. • PUBLIC SAFETY

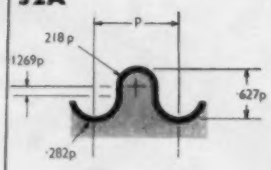
World Screw-Thread Forms—III

31



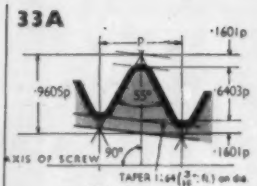
American National
BUTTRESS

32A



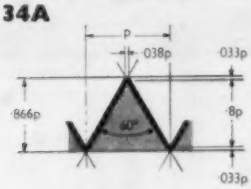
British Standard
ROUND for Fire Suction Hose

33A



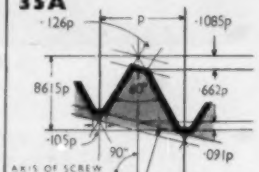
British Standard
WHITWORTH TAPER
for Water well Tubes

34A



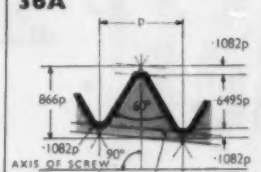
American Standard
PIPE STRAIGHT

35A



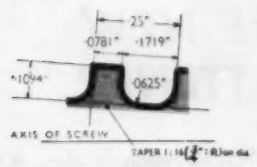
American Petroleum Institute
A.P.I. 7 – Thread

36A



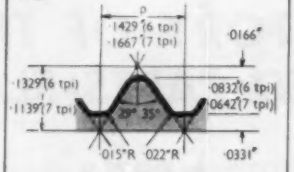
METRIC TAPER

37A



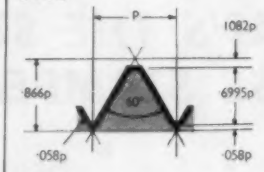
British Standard INSULATOR
(Overhead Power Lines — Lead Heads)

38



British Standard
INSULATOR (Telegraph)

39A

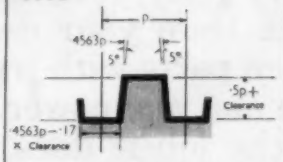


METRIC (S.I.)

40A

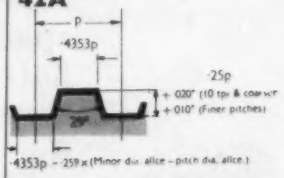
ARTILLERIE

41A



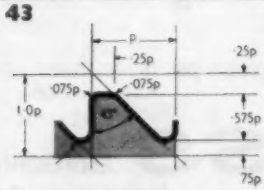
American
MODIFIED SQUARE

42A



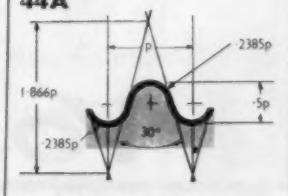
American Modified
STUB ACME Form 2

43



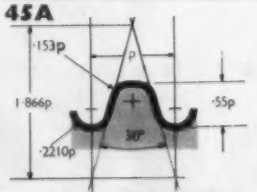
BUTTRESS 45°
(Continental)

44A



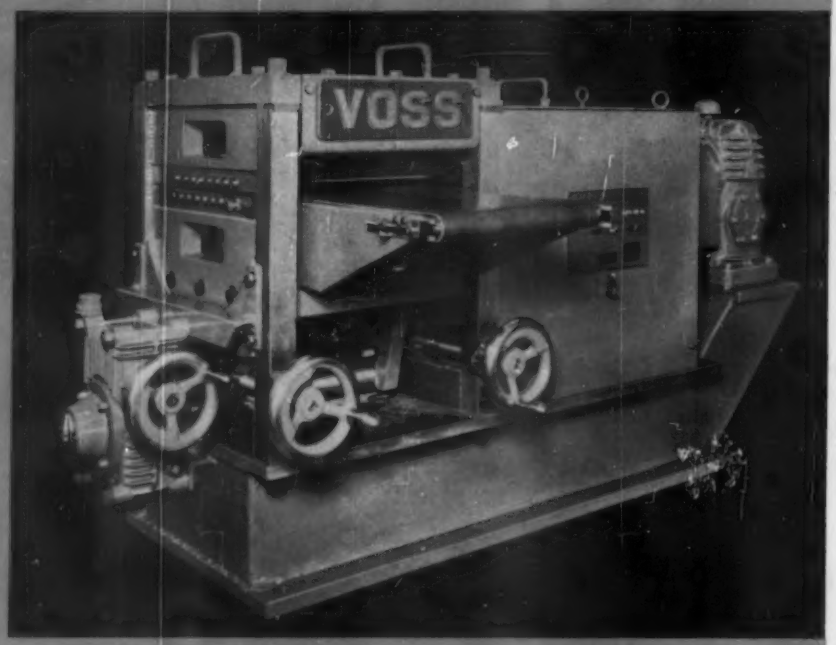
ROUND 30° (I.S.A.)

45A



ROUND 30° (Extra Deep)
(Continental)

This series to be continued in future issues



FLAT! FAST!

THAT'S THE STORY OF THE NEW VOSS STAMPED PARTS-FLATTENER

Stamped parts are flattened to .005 of dead flatness *in one pass!* Hand or automatic feed. Heavy duty, low maintenance. Takes no more space than your desk. Can be engineered to flatten parts with irregular surfaces. Savings in time and manpower can be enormous. Low cost for the job it does. If you're looking for cost reduction in your stamped parts operation, call or write Voss Engineering Company.

We'll be glad to arrange a demonstration with your parts, without obligation.

Voss ENGINEERING CO.

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(Makers of the Voss Precision Roller Leveler)

Talking Shop

New Idea

SOME YEARS AGO we were struck by an ad for wind-up phonographs that made them sound like a brand-new idea: No worry about the right kind of current, no messy cords to trip over, etc.

We were reminded of this when P W House of Delco-Remy pointed out some of the advantages recently of what GM calls "individual build." This is the method in which one person starts in and puts something together and you will recognize it as being at least as old as the hand screwdriver, and perhaps older.

But as House describes it, the individual build sounds like a brand new approach. It eliminates the line balance losses that occur when dividing assembly into multiple operations along a moving belt. It is good for morale: "I assemble a light switch" instead of "I put nuts on coil terminals."

Changes in schedule can be made in increments of one operator. Production is not disrupted by an absentee. When several people are making the same assembly a sense of competition naturally develops.

Obviously, individual build has disadvantages—that's why the assembly line was born—but with properly designed and equipped work stations and well-trained operators it also presents advantages and should not be overlooked in selecting the assembly method.

Satellite Shops, Again

SOME OF THE PROBLEMS of the private tool and die shop were studied recently by two professors at the University of Connecticut (AM/MM—Mar 21 '60, p118). Now comes a study, from a different angle, by Profs Paton and Dixon at the University of Michigan.

Even though the small independent shop pays wage rates that average 25 to 48c higher than those in captive shops, the overhead is so much higher that the hourly cost of production is likely to be double that of the job shop.

The continuing shrinkage of the pool of independent shops is probably the result of faulty cost accounting in the large companies that keep adding to their tool and die facilities.

While it is true that captive shops are essential, say Paton and Dixon, they are not a full replacement for the job shop pool. "Nor can a proper balance between independents and captives be maintained where the job shops find it necessary to sell at distress prices on a continuing basis."

Copies of the complete report are available from the Bureau of Business Research, University of Michigan, Ann Arbor, Mich, for $2. And, by the way, copies of the U of Conn study are available from the AM/MM Reader Service Department, 330 W 42nd St, for $1 a copy.

New Finish

MACHINE TOOLS are now being refinished with epoxy-base paint at Midwestern Machinery in Minneapolis. They report the reaction to the higher gloss is enthusiastic. Has anybody tried alkyd (the plastic base now used on many cars)?

Surplus Shock

A WORKMAN recently received a bad shock while working on a machine his company had secured from government surplus stocks. The workman had turned off the main switch on the machine—did not know that the machine had been wired with the coolant pump not connected through the main switch.

Surplus machines often cause difficulty because of the wide differences in electrical standards of the various plants for which they were originally built. It is always best to check and correct, if necessary, the electrical circuits on a machine of this type. The superintendent of one plant which does a lot of government contract work and gets many machines from surplus stocks estimates the cost of this electrical work averages about $200 per machine.

Mooers' Law

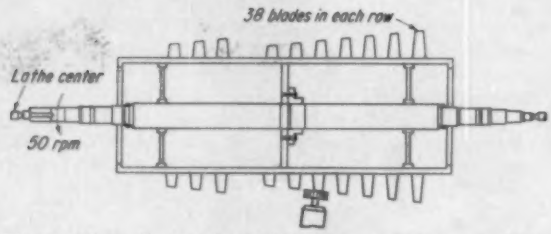
"AN INFORMATION retrieval system will tend *not* to be used whenever it is more painful and troublesome for a customer to have information than for him not to have it."

This "law" is the brainchild of Calvin Mooers, an information specialist. We ran across it in a Senate report on coordination of information. While the "law" has some of the shock value and some of the inherent logic of other popular laws it overlooks the fact that most mechanized retrieval systems tend to provide specialized bits out of context that are awfully difficult to use except in the most exact sciences. They are fine for reporting a chemical formula. They are dreadful for finding the best way to assemble a toaster.

In our observation, men involved in the very inexact science of manufacturing are generally avid for information, but they want it in rich, full detail which they can scan and from which they can select. They don't care much for abstracts with all the juice squeezed out. •

Practical Ideas

Rotary Tool Trims Blade Tips



The blades of certain axial-flow compressor rotors are aluminum castings installed in tapered holes in the rotor body and secured by a nut. Because of size variations in the castings and in machining the tapers, it is necessary to trim off the blade tips to a specified over-all diameter. The conventional method has been to install temporary reinforcement on each blade, then to machine the tips on a tracer lathe, using several single-point tools so that each tool reduces the diameter in successive steps.

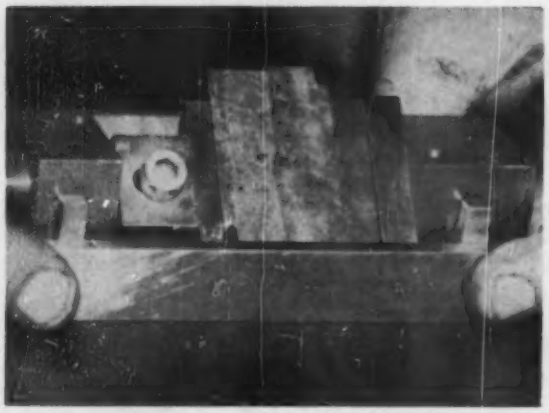
This method is quite slow because of the time required to install the large number of plywood and neoprene reinforcements. We therefore set up the arrangement shown, using an air motor mounted in the toolpost and driving a 32-tooth, 6-in. dia milling cutter at 4000 rpm. The work rotates at 50 to 100 rpm, and feed is 0.015 to 0.060 ipr. There is no particular improvement in surface finish, but reinforcement is no longer required, and a single pass is sufficient to remove as much as ⅛ in. of stock. Floor to floor time has been reduced to one quarter of that formerly required.

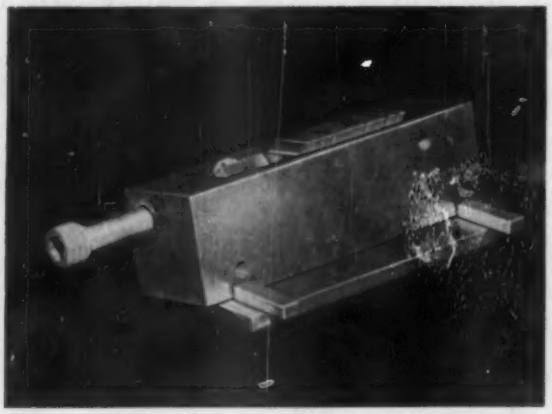
We mount the air motor at right angles to the axis of the work, as we have found that the surface finish is slightly better than when it is mounted parallel to the axis, and there is slightly less deflection of the blades. Either method, however, is satisfactory and produces only about one-fourth of the deflection produced by single-point cutting.

As a matter of fact, we set the motor parallel to the work axis when performing the same operation on stators in a vertical boring mill, and obtain the same savings in machining time.

B A Boggs, Lucasville, Ohio

Simple Vise Helps Grind Bandsaw Guides





The guides of a DoAll bandsaw are among the most important parts of the machine; and certainly they are among the most neglected. Yet freshly ground guides can mean the difference between first-class and mediocre cuts.

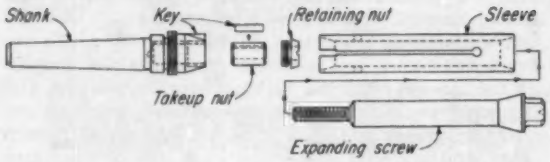
Everyone would like to grind the guides, but there never seems to be just the right setup available, so we continue to use them in their worn condition, hoping that, somehow, someone will grind them.

The simple vise shown here is easily made from a block of CRS. It has a socket-head screw to apply pressure against a clamp block which is retained by another screw in an elongated hole. After the guides have been clamped between the inside face of the vise and the block, the screw is tightened to lock them.

A separate parallel is used to set the guides to the same height for grinding. It has two spacers brazed to it to establish a fixed distance between the top of the vise and the guides. After loading, the vise is turned 90° and placed on a magnetic chuck for grinding. The parallel can also be used to tip up the base of the vise, thus increasing the angle and producing a slight relief at the tip of the guides to prevent the point from digging into the blade. It will be seen in the second illustration that the spacers are set back a certain distance from the edge of the parallel to act as stops for the lower edge of the vise. This distance will depend upon the thickness of the parallel, the width of the vise base, and the clearance angle desired.

M/Sgt James R Wood, Westover AFB, Mass

Production Mandrel Mounts in Lathe Spindle



Once this mandrel is set to take a particular ID, it is only necessary to slip the work over it, bring up the tailstock, and apply pressure to expand the sleeve. This does away with tightening nuts or driving the work on a tapered mandrel, and saves considerable work handling time.

Much of the saving comes from the fact that the entire mandrel assembly is mounted in the machine spindle which must, of course, be checked to be sure it carries the shank concentrically. In addition to the shank, the other parts of the mandrel are: an expansion sleeve and screw, a retaining nut, and a sliding takeup nut with key. The takeup nut and its attached key is a slip fit in the bore and keyway of the shank. The retaining nut keeps this unit in the shank but allows liberal end clearance to permit it to slide back and forth.

During the final machining of the sleeve-carrying taper on the shank, the retaining nut is screwed into place to ensure a uniform taper on both parts. A keyway is then milled into the tapered portion of the shank, and a key is sweated in to engage the sleeve.

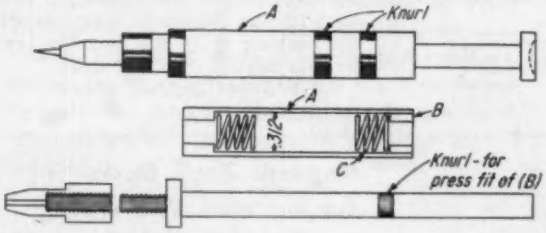
The sleeve is made in the conventional manner by slotting from both ends alternately after the OD, bore, and tapers have been finished. We originally used a 30° taper but have since found that 20° works better and requires less pressure to expand the sleeve.

The expansion screw is threaded to fit the takeup nut, and has a hex or two flats beyond the taper for a wrench. Because a live center is used in the tailstock, the center hole may be larger than would be used for ordinary turning or grinding operations.

To adjust the mandrel, a workpiece is slipped over the relaxed sleeve and the expansion screw is tightened up to expand the sleeve to just below the gripping point. This is done only when making the setup. Then, when pressure is applied by the tailstock center, the takeup nut is pushed into the shank, thus expanding the sleeve. Relaxing the pressure permits the work to be slipped off.

Willard Keehn, Downey, Calif

Semi-Automatic Prick Punch



Most commercially available automatic center punches have the disadvantage that it is difficult to hold them exactly on the scribed line while applying pressure to compress the spring, and they tend to jump when the blow is struck. This home-made prick punch is semi-automatic, and the depth of the impression is controlled by the height to which the barrel is raised. An ordinary phonograph needle is used as a point and is readily replaced when it becomes blunted. All other parts are made of CRS, except the spring. The spring will require some experiment, but it should be strong enough to strike a smart blow, yet light enough to be compressed by finger pressure.

The barrel *A* is 2⅛ in. long ⅜ in. in dia. It is bored out to 5/16 in. to receive the spring, about 1 13/16 in. deep. The lower end is reamed for a slip fit on the 3/16-in. shaft. The nose piece is reamed for a snug fit for the needle used, and is tapped No. 5-44 to fit the shaft end. A knob is pressed on the opposite end of the shaft after assembly. The collar *B* is a slip fit in the barrel and is pressed onto a knurl on the shaft.

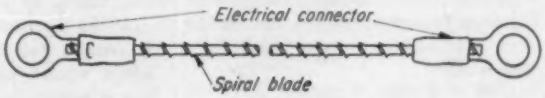
To use the punch, place the point on the desired location and, with the index finger on the knob, raise the barrel with the thumb and second finger. Then release the barrel and allow it to strike down.

Henry E Piltz, E Orange, NJ

Spiral Saw Starts Bandsaw

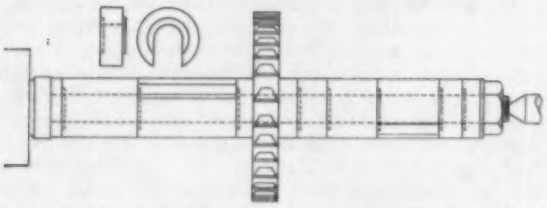
The conventional way to start an internal cut with a metalcutting bandsaw is to drill a hole of about the same diameter as the width of the saw blade. This usually makes the slug unsuitable for further use. To avoid this, we drill a small starting hole just big enough to accept a spiral blade similar to those supplied by Do-All. We crimp an ordinary electrical connector to one end of a short section of blade and thread the free end through the hole. Then we crimp another connector to the free end and hook the eyes onto an ordinary hand hacksaw frame. We lengthen the cut by hand sawing until it is long enough to accept the bandsaw blade, thread this through, and weld the ends in the usual manner. The spiral blade is removed by cutting off one connector. It can be reused several times for just the cost of one new connector.

Boris T Smirnoff, White Plains, NY



Practical Ideas

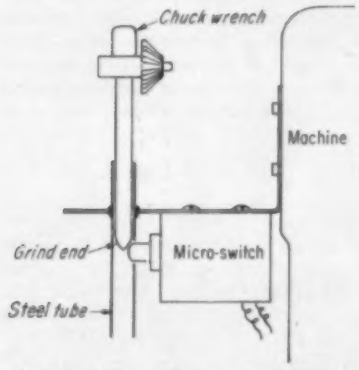
Slotted Spacers for Easy Cutter Shifts



To avoid the trouble of loosening the overarm and outboard support on a milling machine when we have to shift the position of the cutter, we made up special slotted spacers. These have a counterbore on one end and a matching projection on the other end. To relocate the cutter, we loosen the retaining nut and lift off the spacers, slide the cutter to its new position, and slip on new spacers to suit. For safety's sake, we rotate the spacers so the slots do not line up with each other, and use solid spacers on each side of the cutter and next to the nut.

H. Koslow, Bronx, NY

Chuck Wrench Operates Safety Switch



All too often, when an operator has finished a job on a lathe or drillpress, he walks away and leaves the chuck wrench in the chuck. This can be a real danger if somebody switches on the machine without noticing the wrench. A drill chuck key will fly out and may injure the operator or someone nearby; a lathe chuck wrench will either fly out or damage the machine.

The safety device shown in the illustration consists of a piece of tubing welded to a sheet-metal bracket attached to some convenient part of the machine. To the lower side of the bracket is fastened an ordinary Micro-Switch whose business end passes through a hole in the side of the tube. The switch is wired into the motor circuit. When the wrench is removed from the tube the circuit is broken and the machine will not start. Another advantage is that wrenches are not so easily misplaced. For ease of operation, the end of the wrench should be ground to a bullet-nose shape.

Jack W Fields, Syracuse, NY

Saw Blade Speeds Tapping

We had to hand tap a large number of nuts and found it to be very time consuming to put them into a bench vise one at a time, tap, then open the vise, remove the finished nut and insert a fresh one.

To speed up the job, we lined up a group of blanks on the flat side of an old hacksaw blade in a row as long as the width of the vise jaws. Then we slipped the blade between the jaws, tightened up the vise on the nuts, and removed the blade. This cut tapping time by at least a third.

Harry J Miller, Sarasota, Fla

Screw Saves Vise Packing

In using the cutoff bandsaw in the toolroom we frequently find that the piece of stock is shorter than half the width of the vise jaws. This requires the annoying and time-consuming chore of looking for scraps of the right size to serve as packing to hold the swivel jaw square. We solved the problem quite simply by tapping the lower left-hand corner of the movable jaw for a large machine screw. Now, almost anything that is somewhat smaller than the workpiece will serve as packing, as the screw can be run up with the fingers to bear against the packing while the movable jaw is held square with the work.

E T Feller, Seattle, Wash

Otto Unzicher Peru, Ill Won $25 for his idea:

Magnetic Angle Blocks Support Work Two Ways in the April 3, 1961 issue

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning ideas made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc, and those of its advertising agencies or departments. Suggest to your employes that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

LET'S KEEP

Business Help For Our Colleges Going Full Speed Ahead

"Should our company fold up its program of financial help for higher education now that the Kennedy Administration plans to have the federal government provide this kind of help in a big way?" It is clear why, in the light of campaign promises and plans announced since, this question is being raised in many business firms at this juncture.

What seems far clearer, however, is the right answer to the question. It is a resounding NO! **This is no time for the business community to ease up in what have been its notably successful efforts to help our colleges and universities get out of the deep financial hole in which they are operating. On the contrary, this is the time to put more steam than ever behind the drive of business to increase its financial help for higher education.**

Massive Help Needed

It is easy to understand why any individual businessman or firm might have a rather despairing feeling about the prospect of competing with the federal government, with its almost all-embracing tax arm, in providing financial support for higher education or almost anything else for that matter. But this is not a case of competition. It is a case where our colleges and universities must have massive help all along the line if they are to be put squarely back on their feet financially—a goal of crucial and perhaps decisive national importance. **The business community will continue to have both the opportunity and the obligation to keep on increasing its help for higher education as rapidly as possible.**

To underline this proposition take a look at the chart at the top of the next page. It shows how far the salaries of college and university faculty members continue to lag behind those of other occupational groups in the U.S.A. There has been some relative improvement in the average of faculty salaries in recent years. And the salary improvement in some fields, such as those of science and mathematics, has been very pronounced. But the chart makes clear how badly the average salary of college and university faculty members still lags.

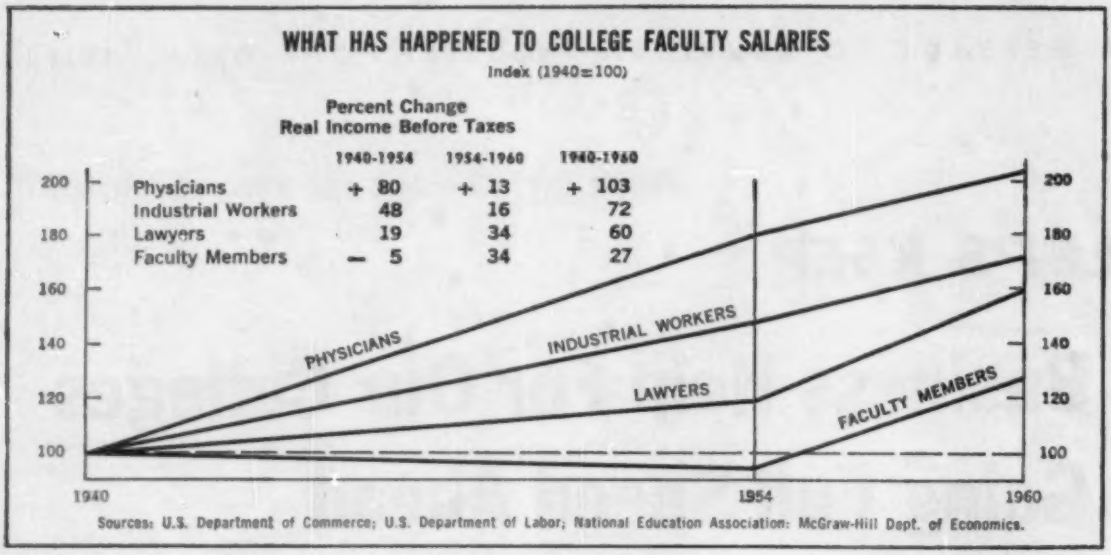
No Federal Funds For Salaries

The plans for increased financial aid for higher education, proposed by President Kennedy, do not contemplate increased expenditure for faculty salaries. This, we believe, is wise whether or not you feel, as many do, that resort to this kind of federal financing would inevitably carry with it federal controls that would ultimately undermine academic independence. The fight over federal appropriations for faculty salaries would be so long and bitter that it would be destructive to the aid program as a whole.

However, what the federal government will not be doing to remedy the deplorable condition of faculty salaries, as reported by the chart, is one indication of the tremendous scope that remains for crucially important help for higher education from business. Manifold other indications are available.

Disaster Escape Route

One of these indications is provided by the careful calculation that the annual income of our colleges and universities must be increased by about $4½ billion (from about $4½ billion to about $9 billion) over the next eight years if the tremendous wave of students



now gathering to descend on these institutions is not to wind up in both a financial and an educational disaster. This wave promises to add more than 2.5 million, or 75%, to college enrollments by 1970.

Thus far, the program for financial help for higher education by business, spearheaded by the Council for Financial Aid to Education, has been a remarkable success in all dimensions. The dollars contributed have increased rapidly—from about $100 million five years ago to about $150 million this year. Contributions of $500 million a year by 1970 are a clear possibility.

One of the inspiring developments increasing this possibility stems out of Cleveland, Ohio. There through their chief executives, an imposing group of business firms have established one per cent of their profits before taxes as their minimum goal for contributions to higher education, to be reached within three years. General acceptance of this goal by business would go most of the way toward getting our colleges and universities firmly on their feet financially.

Mutual Respect Increased

The mutual esteem of the academic community and the business community, an element of enormous importance to a free society, has been increased by the manner in which the program of financial aid has been carried out. In making its contribution, there has been no attempt whatsoever on the part of business to encroach upon the academic freedom of the institutions financially benefited. And the program of financial aid has greatly increased the knowledge, understanding and respect which the colleges and universities and business have for each other.

The Kennedy Administration's program to enlarge federal financial support of higher education is certain to arouse strenuous controversy. As proposed by its Task Force, it avoids some of the most controverial areas of principle. However, the very magnitude of the proposed extension of the federal government's already vast program of financing higher education involves fighting issues.

But if the enlargement of federal aid were to be deeply discouraging to the continued expansion of private aid for higher education, it would be a national misfortune of major proportions. There is no good reason why it should be. On the contrary, there is compelling reason for the business community to continue giving higher education all the financial help it possibly can, thus speeding onward a program that has been and continues to be a major constructive force for our colleges and universities, for business and for the nation.

This message was prepared by my staff associates as part of our company-wide effort to report on major new developments in American business and industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY

Milburn A Hollengreen

As he crosses the ocean
He'll get some new notion
—A grinder that's novel
and new
And don't be evasive
If you find an abrasive
That's better—He'll buy it
from you
He sells and designs
And checks on the lines
Of production in Europe
and here
And when he relaxes
He checks on the taxes
And explains them to me
so they're clear*

International commuter

The above verse may lack a little something as classic poetry, but it's a pretty fair description of many-faceted Metz Hollengreen, a man who can turn his hand with equal skill to designing (as a hobby) an office interior, or to organizing and operating a complex international sales and manufacturing setup.

Wide-ranging abilities

In between those extremes, Hollengreen has chalked up in his 58 years some remarkable successes as an engineer, as a designer and manufacturer of machine tools, and as an expert on corporate taxes and government-industry relations.

As president and general manager of one of the world's most progressive machine tool companies—Landis Tool Co of Waynesboro, Pa—Hollengreen has achieved an international reputation for business acumen and farsightedness.

Under his leadership, for example, Landis has not only in the last decade or so acquired Gardner Machine Co of Beloit, Wis, and Abrasive Machine Tool Co of Providence, RI, but England's John Lund Ltd (now Landis-Lund) and France's Gendron Freres.

"You'll note," Hollengreen says, "that we stick to the thing we know best—grinding—no matter how we diversify geographically."

The internationalization of Landis (he looks on all company operations as part of a whole, does not regard Lund as British, or Gendron as French) represents somewhat of an about face on Metz Hollengreen's part.

"Back in the early 40's, before the war," he admits, "I was pretty well convinced that Landis, or any U S firm for that matter, would be most efficient if it could manufacture everything in one place—in Landis's case that would be Waynesboro, Pa.

"Since then, I've come around to a completely different way of thinking—one I was forced into by conditions here at home. During and after the war, wages and material costs started to spiral in this country. Landis had always been one of the biggest American machine tool exporters and we suddenly found ourselves being priced out of overseas markets. Obviously, the government wasn't going to do anything about it, so the only thing to do was to set up manufacture in countries where costs would allow us to compete."

43 Atlantic crossings

The job of organizing grinder manufacture and sales on an international scale has made of Metz Hollengreen a seasoned traveler who has crossed and recrossed the Atlantic no less than 43 times, 34 of which were in the last three years,

*From a toast delivered by his longtime friend, Washington attorney Joel Barlow, at a dinner celebrating Hollengreen's 25th anniversary with Landis Tool Co, May 2, 1961.

and who has visited the United Kingdom, France, Spain, Germany, Italy, Switzerland, Holland, Belgium, Sweden and Denmark.

That's a far cry from the little railroad town of Renovo, Pa, "stuck in the mountains," where he was born and brought up as a pretty typical American kid. He played four years of basketball for Renovo High, incidentally, before moving on to Cornell University, where he took an M E in 1926.

(His youngest son, by the way, is taking pre-med at Cornell today, is a member of the same fraternity, Lambda Chi Alpha. The other is a junior at George Washington University Law School.)

From Landis Machine

Metz Hollengreen's first job ("I don't know what you'd call it—it covered everything from sales to experimental work with thread chasers") was with Landis Machine Co of Waynesboro—not to be confused with Landis Tool.

Hollengreen "sort of eased into engineering" at Landis Machine, became a designer, and eventually assistant chief engineer. Along about this time he married Leah Fisher, daughter of the man who held the original patents on the company's chaser.

. . . to Landis Tool

In 1936 he moved over to Landis Tool, of which he was already a member of the board of directors, as assistant general manager. In the next six years, as head of engineering and the shop, he was responsible for quite a few grinder designs (several of them incorporating his own mechanical inventions) before becoming general manager.

He took over the top post just as war work went into full swing, and the company turned out as many as 100 of one type of grinder alone each month. At the same time, Hollengreen became active in the National Machine Tool Builders' Association's important Government Relations Committee.

"I spent almost as much time in Washington as I did in the plant," he says, "pleading for men, materials, priorities and Certificates of Necessity—anything to keep the machine tool industry going at full blast."

His government relations work for NMTBA continued after the war. He was named Committee Chairman in 1948 (the same year in which he became president of Landis). His work for NMTBA was to aid in renegotiation of contracts and earnings for the machine tool industry. This also brought him into the first big union-management hassle over the possible effects of automation.

Hollengreen's job was to rebut contentions that automation would cause widespread unemployment and disrupt the country's economy, and to prove to the contrary that without it the nation would go backwards industrially.

Headed NMTBA in '55

NMTBA named Hollengreen as president in 1955. "That was a Machine Tool Show year, if you recall," he says, "and being president was a hectic job but at the same time it was a lot of fun."

About six years before that, Landis Tool, headed by Hollengreen as president, began to expand. Its first acquisition: Gardner Machine Co, Beloit, Wis, manufacturer of abrasive disks and grinders.

Then came Landis's first overseas acquisition, John Lund Ltd, British grinder manufacturer, in 1958, and quickly thereafter Abrasive Machine Tool Co of Providence, R I, which was moved lock, stock and barrel to Waynesboro and is now an integral part of Landis.

Last year Landis bought Gendron Freres, France's largest manufacturer of grinding machines. Landis thus today has in Hollengreen's words, "One of the largest grinding machine plants on the Continent building for the European Common Market, and a plant in England doing the same thing for the British Commonwealth."

Foothold in Far East

Not only that, Landis now has a foothold in the Far Eastern grinder market. Gendron has licensed manufacture of its machines to Japan's Toyota Machine Tool Co. Reportedly, the Gendron-Toyota setup is already Japan's top producer of grinding machines.

Hollengreen, as head of the entire Landis setup, sounds like a one-man "Who's Who in Industry." His titles: president and general manager of Landis Tool, president of Gardner Machine Co, chairman of Landis-Lund Ltd, and president of Gendron Freres S.A.

Hollengreen, a man of definite opinions, pulls no punches in talking over the future of the U S machine tool industry.

"I really think," he says, "that there will be far fewer machine tool companies in this country in the next decade or so—maybe 20% fewer. You can look for consolidations, mergers, and even a few failures.

"Not only that," he says, "Unless our depreciation setup is changed materially, many machine tool companies will be driven out of the United States, and even out of business. President Kennedy's proposed tax credit plan isn't going to do much to stop it either—it's a case of too little, too late.

"What do I think the government ought to do to help the machine tool industry? It should let an industrial firm charge off any kind of productive equipment within ten years—it's as simple as that."

On foreign competition

"This would help a great deal, but it's not a cure-all. Let's face it, foreign competition is bound to get stiffer and stiffer in the years to come—and you can lay most of that trouble to our high U S wages.

"No matter what anyone says, Europe and the rest of the world will never catch up to U S wages. How can they if we keep increasing ours at an even faster rate? Take England, for instance. Last year, the general wage increase in the engineering manufacturing industry amounted to about 4¢ an hour and labor regarded that as a great victory. Our increase in America was much more."

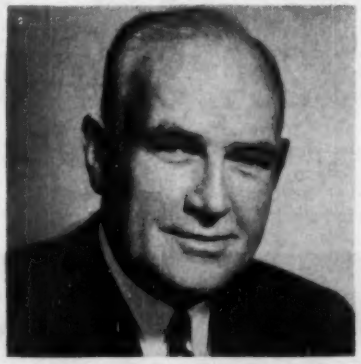
Doing his level best to keep his company and his industry abreast or ahead of changing world manufacturing and marketing trends has kept Metz Hollengreen a busy man.

It has almost made him a man without hobbies. "I admit I don't have enough of them," he says, "I'm just half an hour away from Gettysburg, yet I've only been to the battlefield once. That's heresy, I guess, in the Centennial Year of the Civil War."

It's a pity that he hasn't had a chance to exercise his very real flair for design: Not just grinding machines and the like, but for interior decoration. He decorated his own office, Landis's suite at an inn near its plant in England, and even the company's suite at a hotel in Waynesboro.

Or maybe building up an industry in this changing metalworking world is vocation and avocation enough for any man. •

Names in the News



Chicago Pneumatic Tool Co, New York, has elected **Norman Readman** (left) president. Formerly managing director of all overseas operations of the company, he succeeds **Guy J Coffey** who has been named board chairman and chief executive officer. **H Arnold Jackson,** former board chairman, will continue as a director and chairman of the executive committee

Fellows Gear Shaper Co, Springfield, Vt, has elected **William E Millikin** treasurer and a member of the board. He succeeds **Frederick P Dashner** who has retired

American Pulley Co, Philadelphia division of Van Norman Industries, has elected **Vernon Marsh** vice president. He moves up from the post of factory manager.

Stanley Works, New Britain, Conn, has elected **William F Oswalt** executive vice president. He replaces **Howard L Richardson** who was named president last March.

Barden Corp, Danbury, Conn, ball bearing manufacturer, has appointed **Richard I Kern** vice president, marketing. He was formerly vice president, marketing, of Miniature Precision Bearings Inc, Keene, NH.

Producto Machine Co, Bridgeport, Conn, has named **Daniel J Williams Jr** manager of the Cleveland plant. Prior to joining the firm, Mr Williams was vice president of Connecticut Tool & Engineering Co.

Chrysler Corp has appointed **William R Donnelly** president of the **Amplex Division** to succeed **William P Balthrop,** recently appointed president of the **Airtemp Division.** Mr Donnelly was formerly treasurer of Chrysler International S A with headquarters in Geneva, Switzerland.

Dodge Manufacturing Corp, Mishawaka, Ind, has appointed **John M Macy** assistant to the vice president in charge of engineering. He joined Dodge in 1960 as a project engineer.

General Motors Corp has promoted **Robert D Goodwin** to the post of superintendent of tool manufacturing at the **Delco Products Division.** Formerly general foreman of the die section of the tool room, he succeeds **Herman Meier** who has retired after 42 years of service with the division.

Ajax Magnethermic Corp, Youngstown, Ohio, has promoted **Clarence C Hanson** to vice president and general manager of the Trenton Division, Trenton, NJ. He will be in charge of the Induction Melting Equipment Division of Ajax. Mr Hanson was formerly vice president in charge of sales. **James K McLaughlin** moves up from assistant division manager to vice president, Youngstown Division.

Illinois Gear & Machine Co, Chicago, has elected **R L Durgin** a vice president. He has been associated with the company since 1955.

Palnut Co, Mountainside, NJ, maker of locknuts and fasteners, has appointed **Richard A Hartman** vice president and product manager. He has been associated with the company since 1956.

(Continued on p 140)

Ex-Cell-O Corp of Canada Ltd, London, Ont, has named **George F Howard** production manager. Prior to joining the firm Mr Howard was associated with Canadian Westinghouse Products Ltd

Standard Gage Co, Poughkeepsie, NY, has elected **John E Aldeborgh** executive vice president. He was previously vice president in charge of sales

Morton Manufacturing Co, Muskegon Heights, Mich, has appointed **Sherwood J Basch** vice president, engineering. He has been associated with the firm in various engineering capacities since 1940

Part: Insert for car-door knob

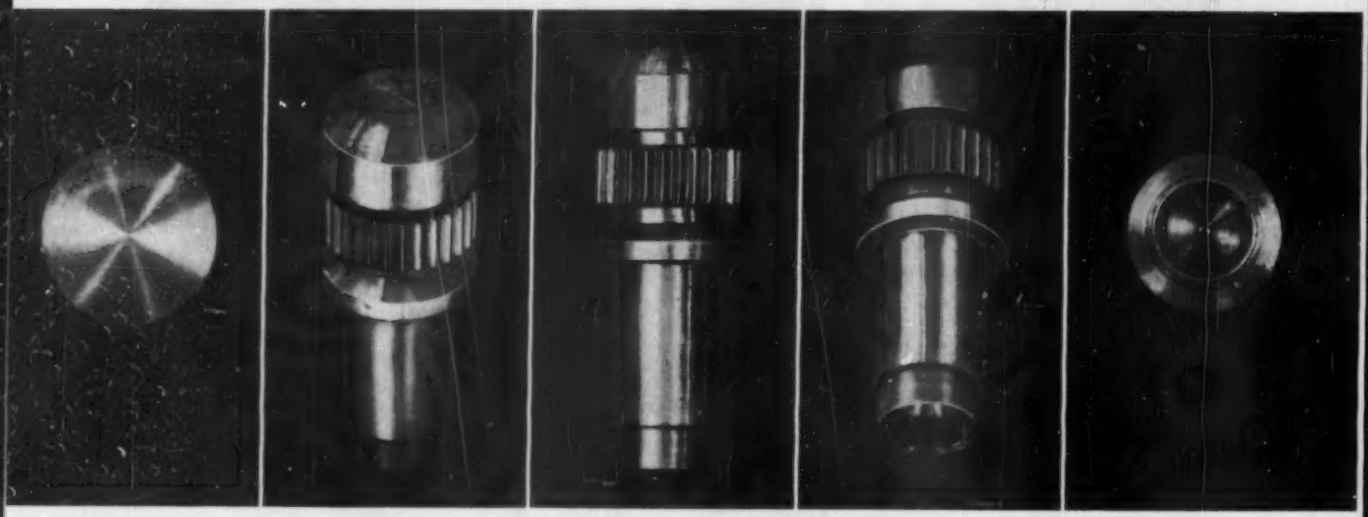
Screw Stock: 13/32 in. BETH-LED round, cold drawn

Chip Removal: 41 per cent

Cutting Speed: 284 SFM—up 29 per cent*

Production Rate: 1920 pieces/hour—increased by 33 per cent*

*over the control stock: C1213 non-leaded steel



BETH-LED

Beth-Led machines fast without sacrificing tool life. Chip control is excellent. Machined finish is tops. The addition of lead to the steel is carefully controlled to achieve the most uniform distribution possible throughout the section. Your bar automatics will eat it up.

Available through non-integrated cold-drawers

Plan now to cut *your* production costs with Beth-Led. It's readily available . . . cold-finished as distributed by non-integrated cold drawers . . . or hot rolled, as produced by Bethlehem.

Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Light Filament-Wound Reinforced Plastic Parts Have 200,000 lb Tensile Strength

Filament wound plastic parts, stronger than steel yet lighter than aluminum, are now available in straight tubes, close-end pressure vessels and a variety of geometrical shapes.

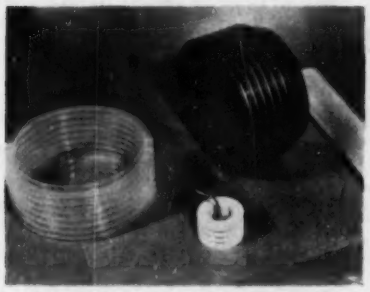
The parts are produced by immersing a continuous strand of fine glass filaments in a resin bonding agent. The resin coated filaments are then wrapped around a revolving mandrel in a pattern that orients the filament in such a way as to best absorb stresses. The bonding agent distributes stresses between the continuous strands of filaments. After curing the resin bond the mandrel is removed and the parts can then be machined and finished.

The plastic parts show excellent corrosion resistance and dielectric strength, and weight comparisons with steel reveal a specific gravity of 2.2 for the plastic parts as against 7.3 for steel. Despite this low specific gravity the strength of the plastic is 200,000 psi. in the direction of the filaments.

The excellent electrical insulating properties of these parts make them acceptable for fuse tubes, switch gear components and high power equipment. Any structure or part requiring high strength to weight ratio and of roughly circular cross section can be filament wound.

Taylor Fibre Co, Norristown, Pa

MORE DATA? Circle 51, inside back cover



Teflon clad slip rings consisting of a molded teflon shell filled with epoxy are said to handle high voltages without characteristic arcing damage even under conditions of extreme humidity. Resistance of the rings is reportedly also high and inertness in a temperature range of –200 to +200 C is said to be excellent—*Electro Tec Corp, 10 Romanelli Ave, South Hackensack, NJ*

MORE DATA? Circle 52, inside back cover

Bronze-Plastic Repair Compound Has 9,000 psi Tensile Strength

Devcon Br, a new repair compound consisting of 80% bronze and 20% plastic bonds to iron, bronze, steel aluminum, brass, wood, and glass. It has a tensile strength of 9,000 psi, compression strength of 20,000 psi, and a shrinkage of 0.0005 per in. The adhesive is mixed with a hardening agent, applied without heat or pressure, and will harden in approximately two hours. Once hardened it can be drilled, ground, or machined like metal and is said to give an appearance after machining very similar to bronze itself. Because of its high bronze content Devcon Br expands and contracts like metal so that repair is permanent.

Devcon Corp, Danvers, Mass

MORE DATA? Circle 53, inside back cover

High-Resistance Alloy Gives Long Life at 2050 F Temp

Alloy 750 is an iron-chromium-aluminum, high-resistance alloy that is said to give long service at temperatures up to 2050 F. While its resistivity is 750 ohms/cmf at 68 F, somewhat lower than other similar alloys, its increase in resistance from room to operating temperature is reportedly much greater. This means fewer feet of the wire are needed to produce a given temperature. However, its resistance with time when heated is less than other alloys, according to the manufacturer, so that it maintains greater stability of temperature.

Hoskins Mfg Co, 4445 Lawton Ave, Detroit 8, Mich

MORE DATA? Circle 54, inside back cover

Copper-Clad Epoxy Laminate Offered for Printed Circuits

Phenolite grade EP-492-1 is said to have better electrical properties than XXXP grades and better flexural strength, cold shearing, and flame resistance characteristics than standard epoxy paper laminates.

Average values of 1/16-in. thick specimens are: Flexural strength, lengthwise 25,000 psi, crosswise 23,000 psi, impact strength lengthwise 0.59 ft-lb per in., crosswise 0.58 ft-lb per in., water absorption rate 0.44% in 24 hr, and arc resistance, 120 seconds

Maximum operating temperature of the new material is 250 F, and dip solder resistance at 500 F is 15 to 20 seconds.

Phenolite grade EP-492-1 is cream colored and has a dull finish. It is furnished in two sheet sizes—39 by 39 in., and 39 by 47 in. Cost in maximum quantities is about $1.55 per sq ft. in 1/16-in. thicknesses with 1-oz copper on one side.

National Vulcanized Fibre Co., 1061 Beech St, Wilmington 99, Del

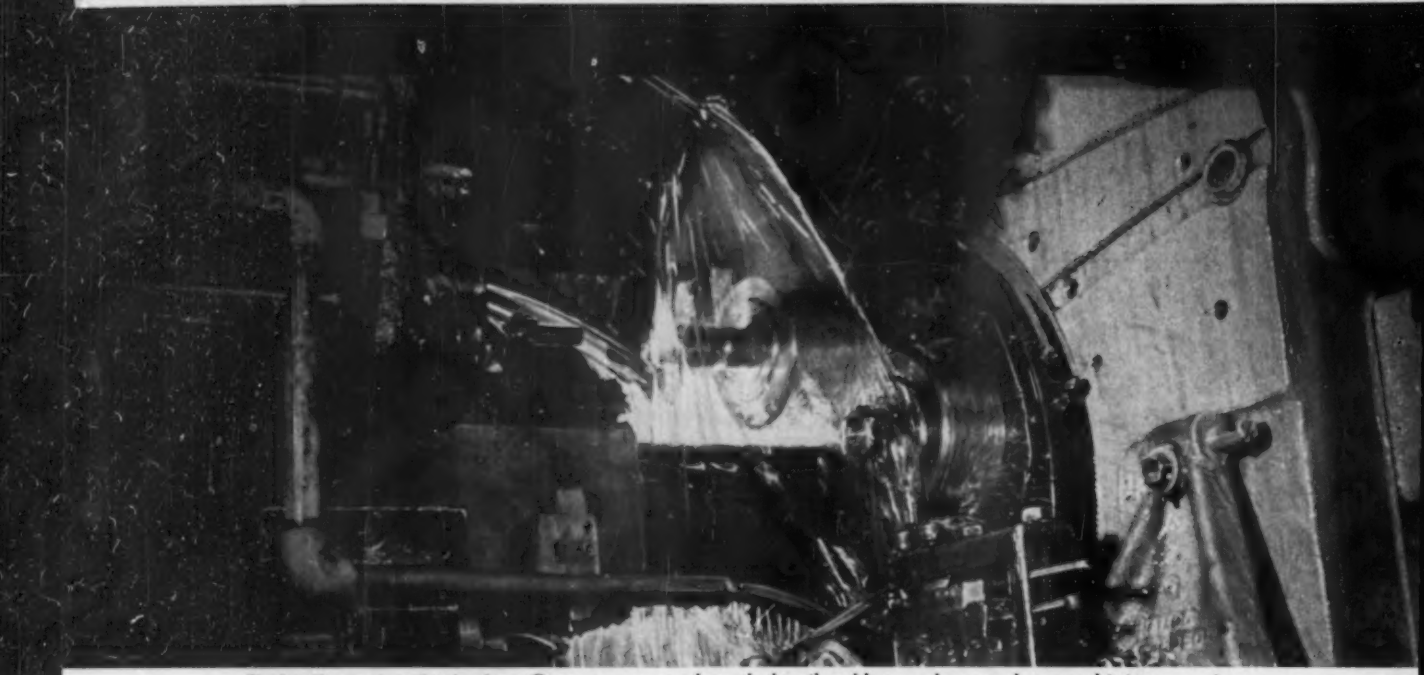
MORE DATA? Circle 55, inside back cover

Soldering Flux Dissolves Oil, Grease, Inhibits Oxidation

Double action of Mayolité soldering flux dissolves oil and grease and at the same time suspends surface oxide on steel copper, brass, and galvanized iron. This is said to reduce the amount of pickling required on high speed baths and to inhibit oxidation of the treated metals.

Farrelloy Co, 1217 North 26 St, Philadelphia 21, Pa

MORE DATA? Circle 56, inside back cover



Garia oils are completely clear. Operators can see through the oil and keep a close watch on machining operation.

CUTTING:

Shell puts heavy-duty properties into transparent cutting oils that lengthen tool life three significant ways

Today, Shell's new Garia® Oils are helping machine shops improve metal finish and prolong tool life —even in heavy-duty cutting. And because Garia is transparent, operators can see the work at all times.

Read how Shell Garia Oils can reduce rejects, cut maintenance and overhead costs in your shop.

UNTIL RECENTLY, most heavy-duty cutting oils were opaque fluids which obscured the work.

Shell scientists took up the problem. They experimented with different formulae until they found the *exact combination* that retained the necessary properties—but did not seriously darken the oil.

Now Shell Garia Oils have the transparency of light mineral oils and the rugged qualities of heavy-duty oils.

With Shell's improved Garia Oils, operators can see through the oil film. Work can be inspected more easily.

Garia Oils prolong tool life in three key ways:

1. Garia Oils help prevent metal pick-up. Shell Garia Oils form a more effective film between the work and the tool. This provides better anti-weld protection, and helps prevent metal pick-up on tools.

2. Garia Oils help keep work cooler. Even with high-speed cutting, the metal stays cool.

Cooling helps extend tool life, and helps assure a better finish on the work. Operating costs are lower too.

3. Garia Oils wet faster. They reach the tool point rapidly, cover newly exposed surfaces quickly.

Compact range

Today's range of Garia Oils covers every kind of metal cutting operation.

Result: you do not have to carry large cutting oil inventories. You can do more jobs with fewer Garia Oils.

For all the facts, see your Shell Industrial Products Representative. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry

Film Adhesive Cures at 25 psi, Gives 4700-psi Shear Strength

Scotchweld Brand AF-110 can be cured under pressures in the range of 10 to 25 psi instead of the normal 50 to 150 psi needed for film adhesives. The film adhesive provides metal-to-metal shear strengths of 4700 psi at 75 F and over 4,000 psi at 180 F service temperatures.

The low cure pressures eliminate the need for elaborate jigs and fixtures for pressure application and makes the adhesive suitable for production bonding.

Cure temperature may be varied from 325 to 450 F depending upon materials being bonded and bond properties desired, with the higher temperatures resulting in much shorter curing times. For metal-to-metal bonding, cures can be accomplished in 1 minute at a temperature of 450 F with a resulting shear strength of 2600 psi at 75 F service life.

Minnesota Mining and Manufacturing Co, 900 Bush Ave, St Paul, Minn

MORE DATA? Circle 58, inside back cover

Darwin & Milner Hot-Work Die Steel Resists Scaling, Shock

Firex Special steel is a high nickel, chromium-molybdenym hot-work steel that is non-scaling and refractory to fire checking. It hardens with a minimum of deformation and distortion and is said to have outstanding resistance to bursting strains and to erosion from mold washes.

The steel requires only normal heat-treating procedures. It hardens in air from 1675 F. Drawing at 950 to 1050 F for 4 hours develops best heat resistance, and hardness after drawing at this temperature is 47 Rockwell C. Forging may be done in the range of 1850 to 1950 F.

Composition of Firex Special is 0.45% carbon, 1.50% chromium, 4.50% nickel, 0.75% molybdenum, and 0.20% vanadium.

Darwin & Milner, Inc, 2222 Lakeside Ave, Cleveland 14, Ohio

MORE DATA? Circle 59, inside back cover

New Nut for 1400 F Applications Designed for High-Temp Bolting

The FN 1418, made of Waspalloy, is a one-piece self-locking nut with properties which make it possible to utilize the full potential of high-strength 1200 and 1400 F bolts. Principal applications are on jet and rocket engines, missiles, gas turbines, and other high-temperature power generation equipment. It is designed to develop the full strength at rated temperatures of the recently introduced SPS EWB 1218 series high capacity bolting made of Unitemp 212 for use up to 1200 F. It is also intended as a mate, at temperatures to 1400 F, for the SPS EWB 1615 and BE 1615 nickel-base family of bolts. The FN 1418 also has limited application with these bolts up to 1600 F.

New nut is rated at room temperature tensile strength of 180,000 psi minimum. Minimum tensile rating at 1200 F is 130,000 psi and at 1400 F is 100,000 psi. Unit is a 12-point external wrenching type available in sizes No. 10-32 through ½-20. Prevailing torque type of lock has been formed for use on 0.003-in. reduced-diameter bolt threads.

Standard Pressed Steel Co, Jenkintown, Pa

MORE DATA? Circle 60, inside back cover

Water-Soluble Cutting Compound Increases Tool Life, Eliminates Smoke, Oil Vapors

Vantrol 700, a water soluble cutting lubricant that is said to be capable of replacing straight oils in 95% of the operations requiring straight oil compounds, combines the cooling and wetting properties of water with the lubricating properties of oil. The company claims that the new lubricant is absorbed into the work surface and the tool surface and therefore gives better performance than straight oil alone.

The compound mixes readily in soft or hard water, has good resistance to rancidity, and presents no health or fire hazards.

In field tests with the lubricant an automotive manufacturer is reported to have boosted production of broached wrist pin holes from 2000 to 5000 before broach change and another manufacturer reported an increase from 70 to 370 pieces per tool regrind in drilling Stellite 21 with carbide tipped tools. Smoke and oil vapors were also said to be eliminated.

Van Straaten Chemical Co, Chicago, Ill

MORE DATA? Circle 61, inside back cover

Pfaudler Ceramic Coat Resists Corrosion at High Temperatures

Nucerite, a new family of ceramic-metal composites is said to have exceptional resistance to corrosive attack at temperatures between 500 and 1500 F. The substrate metal for the new ceramic can be carbon steel, (for temperatures from 450 to 700 F) stainless steel, Inconel, or one of the refractory metals (for temperatures from 750 to 1500 F). Field tests with Nucerite reportedly show satisfactory results in handling the following materials at high temperatures: metal halides at 1202 F, refractory metal chlorides at 485 F, coal tar pitch at 750 F, and Aqua Regia plus heavy abrasive at 225 F.

Test samples of the material are available in four standard forms: cup, well, spool and dumbell.

Pfaudler Co, Div of Pfaudler Permutit, Inc, 1129 West Ave, Rochester, NY

MORE DATA? Circle 62, inside back cover

Enthone Nickel Stripper Won't Attack Copper, Steel or Brass

Called Enstrip NP, this new nickel stripper will strip nickel from steel, nickel, copper, and brass or from assemblies made up of combinations of steel, copper, and brass components. Nickel is stripped by dipping materials in Enstrip at room temperature ;elevated temperatures will accelerate the process. At 175 F, nickel plate is removed at a rate of 0.003 in. per hr.

The solution is an alkaline, nonfuming liquid concentrate that contains no cyanide and therefore does away with the problem of cyanide waste disposal. Price of Enstrip starts at $0.70 per lb for small 2-gallon multipacks that contain chemicals to make up a 5-gallon bath.

Enthone Inc, New Haven, Conn

MORE DATA? Circle 63, inside back cover

VR-65 faces stainless steel plate to 3-5 micro-inch finish for Goulds Pumps, Inc.

Grade VR-65 is maintaining a 3 to 5 micro-inch finish with superb tool life on a "316" stainless steel thrust plate for Goulds Pumps, Inc., Seneca Falls, New York. This very high "grind" finish is necessary to prevent excessive wear on the graphite part that bears against the plate in Goulds "Nuclear Canned Pump."

The plate is faced at 1220 rpm on a Hardinge Precision Chucker. The sfpm is 300 at the $1\frac{5}{16}$" inside diameter and increases to 765 at the $2\frac{3}{8}$" outside diameter. Feed is .0009" per revolution and depth of cut is .003". VR-65 produces twice as good a finish in half the time with six times longer tool life per grind than the previous method.

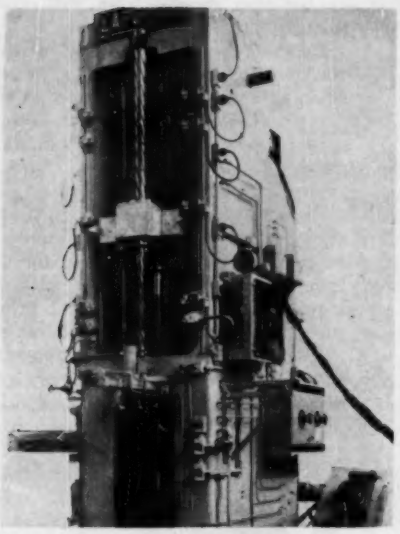
Performance such as this puts VR-65 in a class by itself. On your next machining problem, ask your V-R representative about VR-65 or other cutting tools in V-R's complete line.

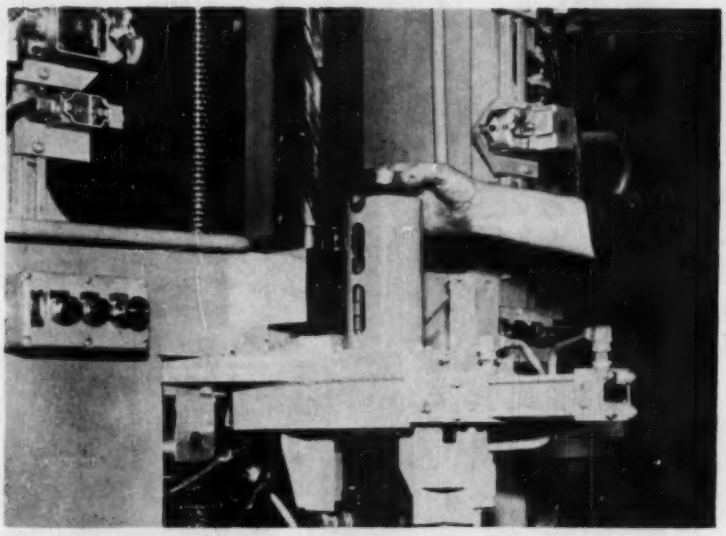
CREATING THE METALS THAT SHAPE THE FUTURE

V-R VASCOLOY-RAMET

MARKET STREET • WAUKEGAN, ILLINOIS

C-839





Vertical pull-up broaching machine uses spiral lead bar to turn tool for broaching 29-tooth helical spline gear. Closeup (right) shows mechanism which stacks 24 gear blanks and feeds them, two at a time, to locating and clamping fixture

Lapointe Broach Pulls Tool Up With Twin Drive Screws

Ball bearing screws in matched pairs replace the cantilever for pulling up the broach in this Lapointe VUE-4, 30-hp broaching machine. This arrangement eliminates the bending force and losses in the slide ways caused by the cantilever beam effect of the conventional method of driving the slide to drive the broach (See *AM/MM*—June 12 '61 p3).

By driving the screws through a gear box, the broaching pull force is transmitted directly to the gear box and the slide and machine ways only guide and stabilize the broach.

In addition, the broach lift mechanism runs on the same way as that of the main slide and follows the broach completely through the cut stroke with a broach guide cup.

A dc-motor, powered by a separate motor generator set, drives the gear box through a pulley belt system. This produces a pulsation-free slide with action so smooth that the gear-shaving operation, which normally follows broaching of a precision part, is eliminated.

More production time is saved by the electric drive system which allows any part of the cut stroke to be operated at any speed from 5 to 40 fpm. Therefore it is possible to run the roughing operation at high speed and the finishing operation at lower speed, all in one stroke.

Tooling for the machine shown includes an automatic broach puller, index type, a special broach handling cup, and a special spiral lead bar attachment for driving a helical spline broach.

The parts handling fixture with magazine-type feed accommodates 24 parts and feeds and ejects two parts per cycle by means of electrically interlocked cylinders. The two parts to be broached are automatically fed into broaching position and the broach shank and pilot lifted through the part ID for location. At this point the fixture hydraulically clamps the parts for the cut stroke and the machine completes the cycle of broaching, unclamping, and ejecting. The illustrated machine was developed to broach a pump gear for an automatic transmission. This gear has 29 helical involute splines broached from a 2.913-in. hole. With a broaching speed of 20 fpm, blanks are broached at a rate of two per minute, at 80% efficiency.

Maximum slide travel on this machine is 72 in., max effective stroke is 70 in. throat depth is 8 in. and max return speed is 65 fpm.

The Lapointe Machine Tool Co, Hudson, Mass.

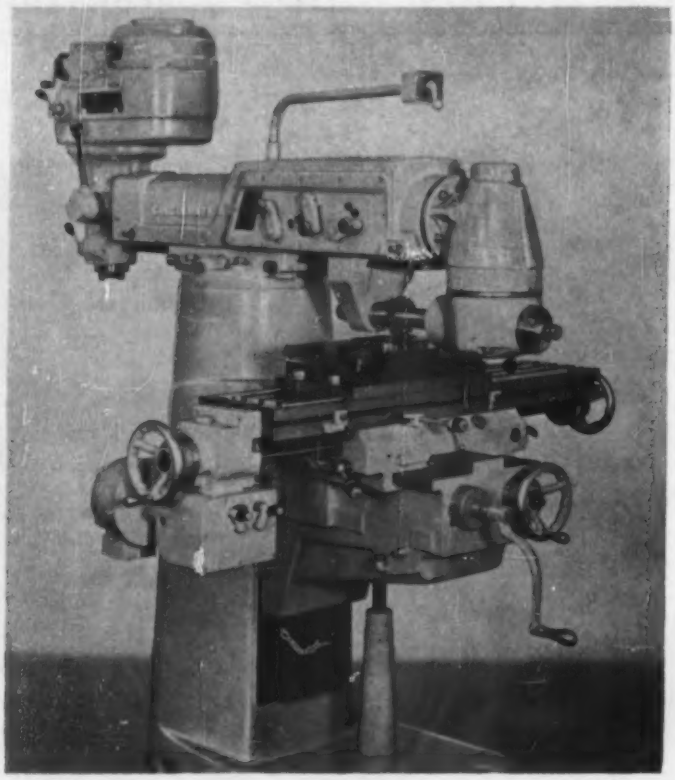
MORE DATA? Circle 64, inside back cover

Kennametal Boring Bars Have Shanks 3X as Rigid as Steel

New Kendex BB-7000 K-Bars are small boring bars with solid Kennametal shanks that are three times as rigid as steel. Five sizes of the bars with diameters of ⅜, ½, ⅝, ¾, and 1 in. supplement the company's RB-5000 Kendex adjustable K-bars of 1 to 2½-in. dia. lengths of the bars are 6, 8, 8, 10, and 12 in., respectively.

Kennametal Inc, Latrobe, Pa

MORE DATA? Circle 65, inside back cover



Cincinnati Two-Headed Milling Machine Swivels 180 deg for Horizontal Milling

Latest addition to Cincinnati's Toolmaster line, the H-V milling machine mounts two heads on opposite ends of its overarm; one does horizontal milling, the other vertical and angle milling. To swing the horizontal head into place after vertical milling, four bolts that lock the overarm in place are loosened and the entire overarm and turret base are swiveled as a unit.

Three heads are available for the vertical milling side of the machine. The No. 1B Toolmaster head has V-belts for eight speed changes and two power feeds. The No. 1D head (shown) has infinitely variable spindle speeds that are selected with a hand crank, and the No. 1E head has lever-selected high or low speed range and V-belt drive for eight speed changes.

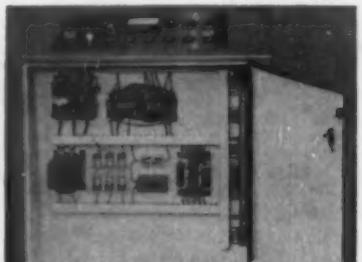
The horizontal head-spindle is powered by a 2-hp motor which offers standard spindle speeds from 75 to 1120 rpm and optional speeds from 50 to 750 rpm.

Range of the machine includes longitudinal table traverse of 22 in., cross traverse of 10 in., center line of horizontal spindle to top of table, max 18¼ in., min 1¼ in., and horizontal spindle nose to face of column, max 20⅜ in. and min ⅜ in.

The 42- by 10-in. table has three 11/16-in. T-slots spaced 2 5/16 in. apart.

The Cincinnati Milling Machine Co, Cincinnati 9, Ohio

MORE DATA? Circle 66, inside back cover



Precision Press Control Gives Remote Speed, Inching Controls

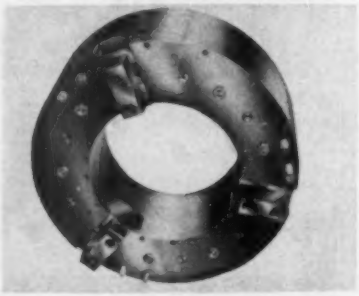
The Flexotron press control combines a fused disconnect, main drive reversing motor starter, control transformer, lubrication pump fuses, control fuse, remote speed control switch, and control panel in a small console. The control features timed inching and top-stop adjustments that permit any inching increment or top-stop height from full shut to full open.

An emergency stop button on the console glows red whenever power is on and the top-stop button glows green whenever lubrication pressure is safe. Other controls on the panel are a total strokes counter and a strokes-per-minute dial.

Flexotron is available for straight-side presses in many styles and can be press mounted. Controller for C-type presses is similar, but without motor reversing switch or oil pressure signal, except on special order.

Precision Welder and Flexopress, Cincinnati, Ohio

MORE DATA? Circle 67, inside back cover



Self-Contained Air Chuck Allows Work To Pass Through Its Center

This new self-contained air chuck allows a workpiece to be passed completely through the center of the chuck body because of its open construction. In addition no permanently attached air supply lines leading to the air chuck are required for the jaw gripping and releasing. Once air is applied to the inlet valve on the chuck body the jaws are activated. The air supply can then be removed and the chuck will retain the air pressure.

Inside the main housing is an annular ring piston that provides the full force for operating jaw movement and holding power. This ring allow the jaws to move equally and simultaneously so that workpieces can be self-centered within a tolerance of ±0.002 in. total indicator reading, according to the company.

Standard models of the chuck are provided with a ⅞-in. movement per jaw which allows 1¾-in. diametrical movement. The chucks are available from 12 to 48 in. inside dia

and may be used as a rotating or stationary chucking device, either horizontally or vertically mounted.

Mollenberg-Betz Machine Co, Inc, 20-26 Henry St, Buffalo 2, NY

MORE DATA? Circle 68, inside back cover

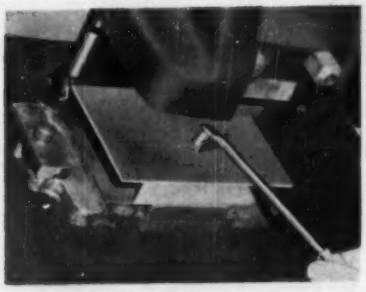
Comparator Checks Masters To Accuracy Within 0.000002

Model 136B-2 electronic comparator that checks master rings and disks to an accuracy within 2 millionths can measure IDs from 0.040 to 4.760 in. and ODs from 0 to 3.5 in. These measurements are made with constant gaging pressure since the contacts are mounted on a free-floating unit which eliminates all friction. Two scales are immediately available by switching: 11,200 X (0.000010 in. grads) and 2200 X (0.000050 in. grads).

Amplifier is transistorized and battery-powered for greater reliability and instant operation with no source voltage fluctuation. Mercury cell battery pack provides 120-1300 hours of service. When not required full time for checking masters in the gage lab, the portable amplifier can be used with an electronic gage head for other measuring applications.

Federal Products Corp, Providence 1, RI

MORE DATA? Circle 69, inside back cover



Press Feeding Magnets Feature Instant Release

PFM press feeding magnets, with no moving parts, employ a fixed cam plate which allows magnetic contact to be broken while holding steel in place. Designed for handling blanks, stampings, or formed steel parts up to 10 lb, the line features easy-grip handles, thin wall tube shafts, and magnetic strength that is guaranteed indefinitely.

Magni-Power Co, Box 122, Wooster, Ohio

MORE DATA? Circle 70, inside back cover

Charts for Optical Comparators Drafted Without Photo Reduction

Custom or standard charts for use on optical comparators are made full size on the Visula Mark 42 vertical drafting machine. No photographic reduction is needed. Angular settings are accurate within 15 seconds of true position; lineal settings within 0.0002 in. of true position. Standard models of the machine are read to within 1 minute or 0.01° angularly and to within 0.0001 in. lineally. Accessories permit readouts to within 0.0001 in.

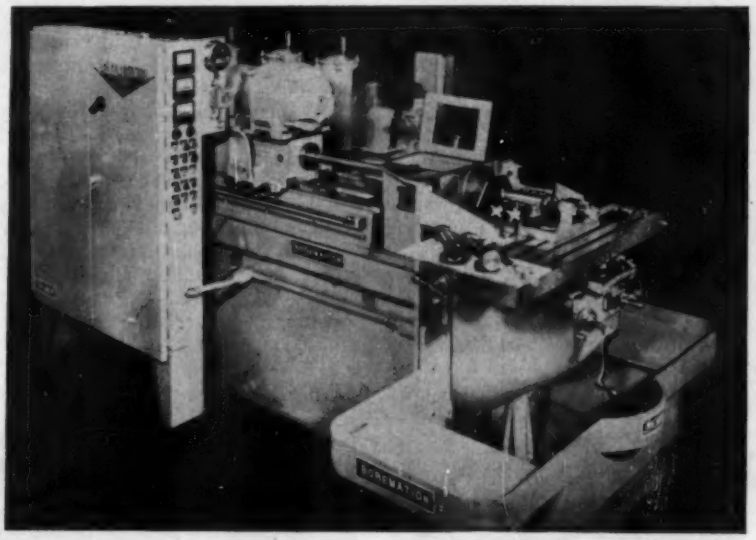
The glass (or mylar, vinyl) on which the layout is being drawn is mounted against a large, Sylvania Panelescent lamp, providing soft, glarefree light for the draftsman.

Visual Inspection Products, Div of Commerce Engraving, Inc, 112 Central Ave, Lynn, Mass

MORE DATA? Circle 71, inside back cover

MACHINE-TESTER trouble detector Model MT-1 is an electronic device that incorporates a transistorized amplifier and a chrome-plated sound absorption rod. Battery-operated pocket-size instrument employs an earphone that makes audible any faint vibration or sound — *Calhear Instruments Co, 412 W 6th St, Los Angeles 14, Calif*

MORE DATA? Circle 72, inside back cover



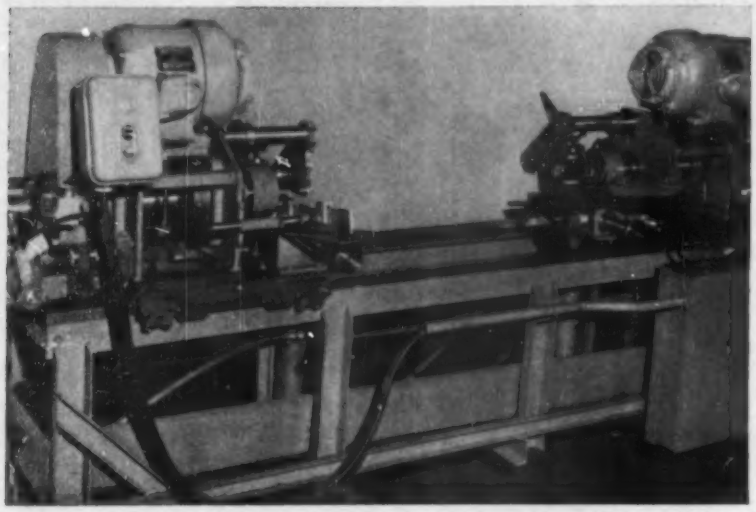
Drillmation's Electronic System Said To Eliminate Scrap and Gun-Drill Breakage

The cost of drilling deep holes is said to be reduced to a new low with this new Monitor Controlled (MC) Boremation gun-drilling machine. The MC is an electronic system designed to remove guesswork from deep-hole or gun-drilling. The system monitors each danger area during the drilling cycle.

The moment the MC system is activated because of a malfunction at the cutting edge of the tool, the drill automatically stops feeding the workpiece before tool or machine can be damaged. Dials, which are an integral part of the control panel, pin-point the cause of the malfunction, making it possible to start corrective measures immediately.

Drillmation Co, Inc, 6500 E Eleven Mile Rd, Center Line, Mich

MORE DATA? Circle 73, inside back cover



Machine Simultaneously Threads, Reams Or Machines Both Ends of Bars or Tubing

Model 448 is a self-indexing machine that will machine, thread or ream both ends of solid rod or tubing in lengths from 4 in. to 48 in. and in diameters from ¼ in. to ⅞ in.

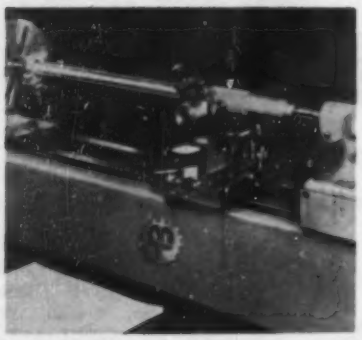
Rod or tubing is fed into the machine over a slide chute and the operation of the machine is maintained as long as there is material in the chute. The stock falls directly into the in-feed chute from the cut-off station and is fed into the machine automatically. Outfeed is also made automatic by having the finished stock leave the machine on another slide chute.

The ends of the machine are independent of each other. Each head is equipped with a 3-speed motion that permits rapid-infeed, slow-down before contact, and rapid return. Each head has a quill-type spindle which will mount thread rolling or cutting tools, and with the addition of box turning tools, facing cutters, drills or reamers, can perform most jobs done by a lathe. The cutting heads are interchangeable, and where one operates at a slower speed than the other, the machine will wait for the slower one before indexing.

The Model 448, complete with 6 sets of clamp liners and 2 Morse taper adapters and yoke plates, coolant pump, pan and strainer, sells for $564.00 (f.o.b. New York).

Automation Design and Machinery Co, 1672 E 233 St, New York 66, NY

MORE DATA? Circle 74, inside back cover



Michigan Gear Checking System Determines Two Types of Errors

This new gear checker—furnished with translucent charts and a light table—is said to determine both true tooth-spacing error and eccentricity without analysis by a highly trained man (see *AM/MM*—May 1 '61 p3).

The new Model 1132 tooth spacing and concentricity checker, used with the system, has a bed with ways, an adjustable pointer carriage and slide, two dial indicators, and a pair of centers. The standard unit, which features a quick-acting adjustable tailstock and over-travel protection for both indicators, will accept shafts up to 36-in. long with 5-in. OD. Larger checkers are available.

The workpiece is positively indexed through use of an index plate—several for different numbers of teeth (odd or even) can be simultaneously mounted on the checker—and then a rack-type pointer tip pivots so that it contacts both flanks of a tooth near the pitch line at time of measurement.

By plotting teeth on a circular graph, the pitch circle of gear or spline is located; super-imposing a blank chart on tooth form circle locates shaft axis.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 75, inside back cover

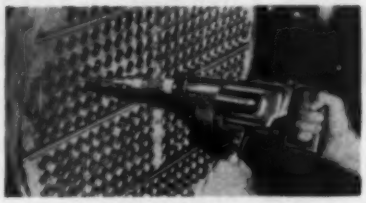
Compact Jarvis Drill, Tapper Lifts Work up to Spindle Head

The Dril-King, a 66-in. high machine designed for drilling and tapping small parts, has a vertical-feed work table that brings the work up to the head. The standard unit comes equipped with 12 spindle drivers and is able to work at center distances down to ⅜ in. minimum. Work area of this model is 6 by 8¼ in.

Basic machine is expected to sell for approximately $1,700, and optional equipment such as air feeds and cluster plates for conversion to a fixed multi-spindle machine can be supplied.

Jarvis Corp, Machine Tool and Attachments Subs, Middletown, Conn

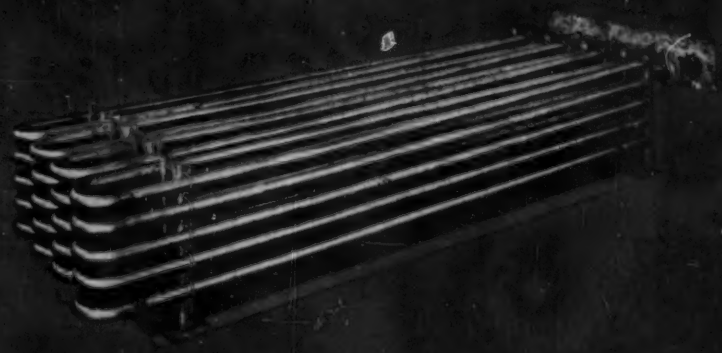
MORE DATA? Circle 76, inside back cover



PNEUMATIC TUBE EXPANSION control, Airetrol Model 900, rolls steel or non-ferrous tubes up to and including ¾-in. size. Tubes can be rolled at rate of 12 per min or better with this unit which operates at 1100 rpm—*Airetool Mfg Co, Springfield, Ohio*

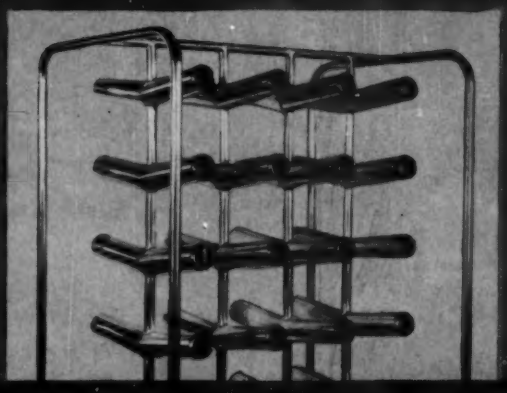
MORE DATA? Circle 77, inside back cover

you can bend it...



you can form it...

you can weld it...



but you can never, no never, change its **consistent uniformity!**

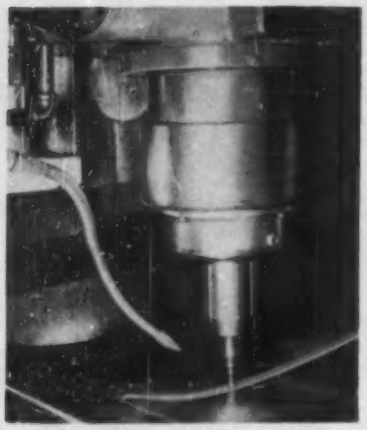
...no matter what test you put it to, you'll get consistent performance, greater output, better quality and more profit with Carpenter Specialty Stainless...produced by one of the leaders of stainless steels for industry.

Carpenter steel

you can do it ***consistently*** better with Carpenter Stainless Steels for specialists

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.

CIRCLE 316 READER SERVICE CARD



Adapter Triples Spindle Speeds On Large Vertical Duplicators

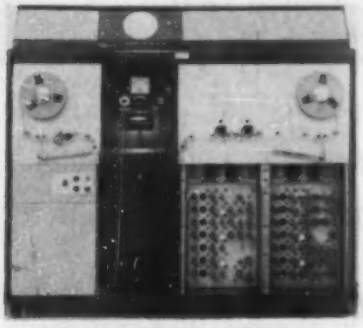
Model HTL-1 spindle adapter increases duplicator spindle speeds to permit the use of small-dia cutters with shanks up to ½-in. Transfering workpieces from large duplicators to small ones for fine, small-dia cuts is eliminated by this adapter, which gives a 3 to 1 spindle speed increase.

Two parts make up the adapter, a mounting ring and a spindle- and housing-assembly. The mounting ring is permanently attached to the existing spindle enclosure so that the spindle housing can be quickly attached to the machine.

The spindle adapter features precision gears and large heavy-duty sealed dual thrust and radial bearings. A small port in the side of the spindle permits lubrication of the gears in prolonged operations.

Permanent Mold Die Co, 2275 E Nine Mile Road, Hazel Park, Mich

MORE DATA? Circle 78, inside back cover



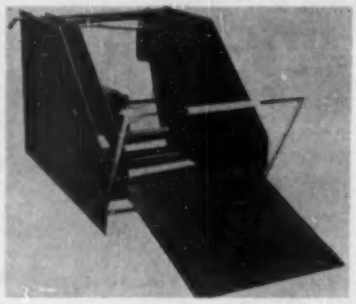
Machine Designed Specifically For Testing Magnetic Tape

Model 7, reported to be the first machine of its kind designed specifically for testing magnetic tape, can be used for preventive maintenance of tape in computer installations and also for production testing of new tape.

Features include 1) repair station —a facility to stop tape error regions automatically at equipped work station where error correction can then be accomplished; 2) circular graphic recorder—gives an accurate permanent record of location on tape of all error regions (record allows operator to decide whether tape should be repaired, shortened, or discarded and can be retained with tape); 3) signal and noise tests —high and low level signal and noise measurements are made during a single pass of the tape. Error rejection levels in each tape channel are independently adjustable to handle any required tape specifications. Testing speed is 120 ips (600 fpm).

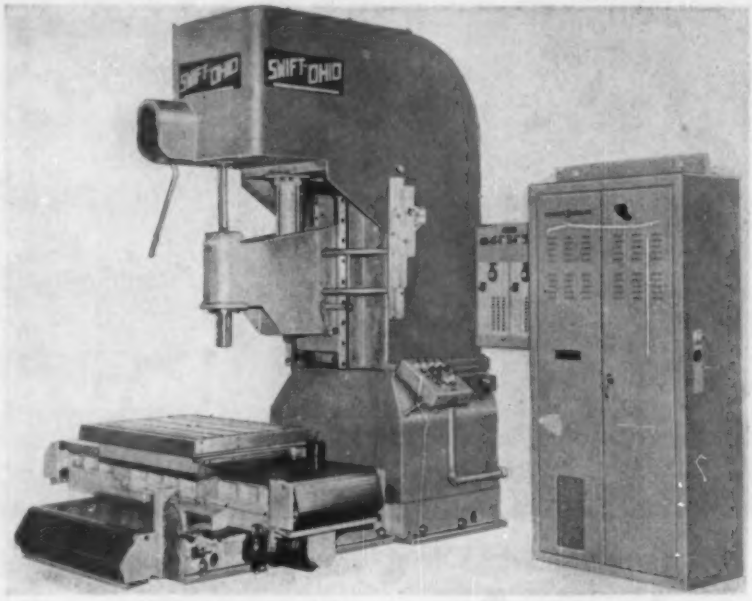
General Kinetics Inc, 2611 Shirlington Rd, Arlington 6, Va

MORE DATA? Circle 79, inside back cover



MEDELTON R-304 POWEROLL COIL cradle modified to handle material up to 30 in. wide at extremely slow speeds has a worm gear speed reducer that drives the cradle at 10 ft per min. The unit is demand-controlled by a combination actuator switch and loop control that operates on 90% captive air and eliminates dust contamination—*Medelton Co, Inc, 262 E Third St, Mount Vernon, New York*

MORE DATA? Circle 80, inside back cover



Swift Ohio Heavy Duty Drill Repeats To 0.0005 in. With GE Mark II N/C

Drilling, boring, tapping and positioning can be automatically or manually controlled on the No. 425 upright heavy duty drill equipped with GE Mark II Numerical Control.

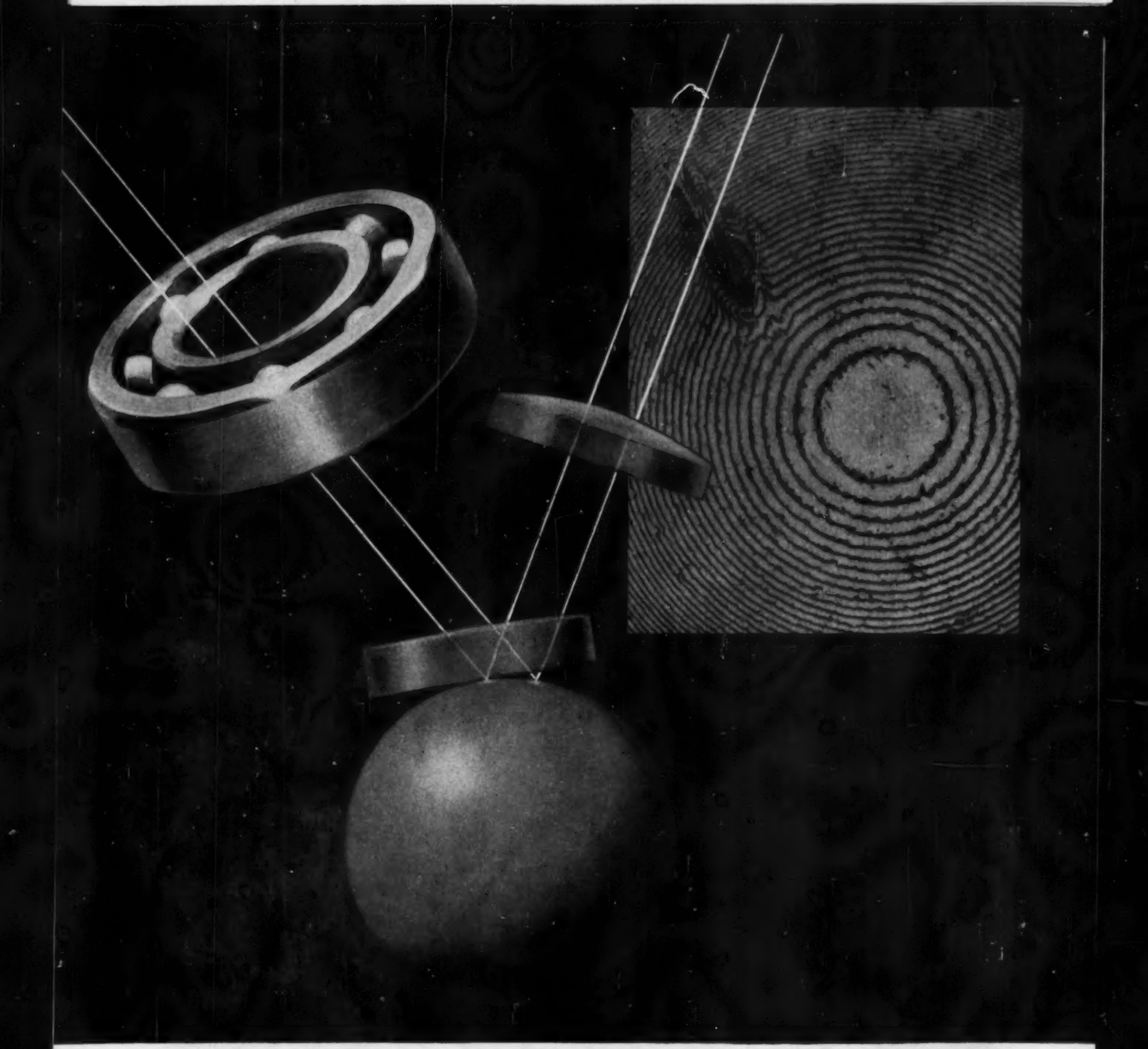
The drill has a 24 by 36-in. numerically controlled compound table, hydraulic feed to spindle, 18 spindle speeds from 52 to 2250 rpm, and fine and coarse feed range provided by quick-change two speed gear range.

Drive to each table movement from the numerical positioning control is by ¾-hp motor, and electrical repeat accuracy is ± 0.0005 in.

Manual control and manual decade positioning are also possible with the setup shown.

Swift Ohio Corp, Kenton, Ohio

MORE DATA? Circle 81, inside back cover



SPLIT LIGHT BEAMS MEASURE IN MILLIONTHS

to help SKF build better bearings

SKF MOTION ENGINEERING

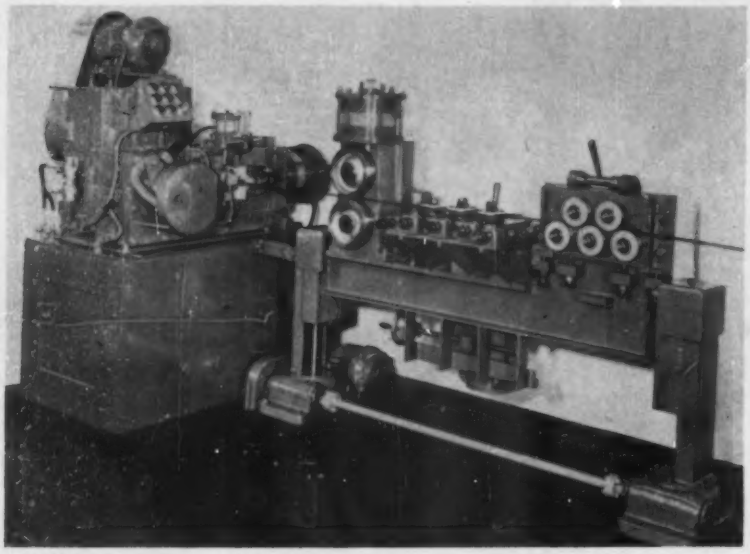
Advanced ball and roller bearing technology

The concentric pattern of interference fringes in the picture above is reproduced from an actual photo taken with the aid of an interferometer in the SKF laboratories. The subject under examination is a microscopic flaw in the surface of an accurately lapped steel ball. The principle of utilizing split beams of light to form interference patterns enables accurate measurements to be made in *millionths* of an inch.

SKF is a leader in the development and application of ultra-precise measuring systems. The SKF metrology laboratory plays an important part in a continuing program of research to produce bearings of improved accuracy and finish, and consequently, quieter, smoother running characteristics.

Whatever types of rolling contact bearings you need—ball, cylindrical roller, spherical roller, tapered roller or precision miniature—you'll find SKF your best assurance of dependable performance. SKF Industries Inc., Philadelphia 32, Pa. 6104

CIRCLE 317 READER SERVICE CARD



Pathex Bar Shear Produces Barstock Slugs at Rate of 100 Pieces Per Min

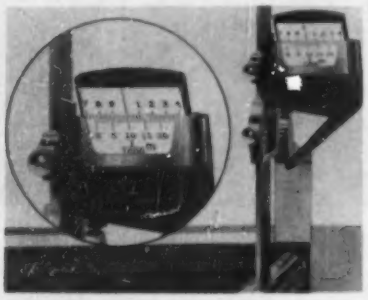
Called the Steelmaster High-Speed Precision Bar Shear, this fully automatic machine will produce barstock slugs with a length tolerance of ±0.001 in. at a rate of 100 pieces per min.

Rate of feed is 4 ft per min and blank size is infinitely variable. The machine, which is available with straighteners for coil-stock feeding, is said to produce slugs from all free-machining materials, including 100,000-psi high-tensile steel, that are free of distortion and have a minimum of internal stress. Models are available to handle stock up to 2½ in. dia.

Prices of the shears start at $7,000.00. Delivery time is 8 weeks.

Pathex Canada Ltd, 74 Railside Rd, Don Mills, Ontario, Canada

MORE DATA? Circle 82, inside back cover

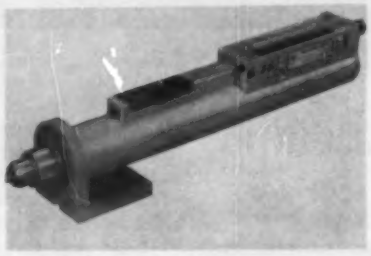


Magnifier Cuts Height Gage Reading Time up to 60%

Magnifying instrument called the Mark V permits readings to be called directly from the magnifying lens without removing the gage or making any other adjustments. It is reported to have reduced reading times up to 60% on milling machines, jig borers, radial drills, and other equipment on which it has been tested. Instrument attaches to the height gage with magnets instead of clamps or screws. It incorporates a precision ground optical lens and mirrors, magnifies scale numbers 2.5 times. Price is $9.95.

Pan Technics Inc, 1230 Pan Technics Bldg, Encinitas, Calif

MORE DATA? Circle 83, inside back cover



Gardner-Denver Air-Powered Drills Cycle Automatically

Air-powered, portable or stationary True-Feed drills drill holes from ½ to 1¼-in. dia and will cycle automatically. The cycle starts with a rapid advance up to the work where an adjustable trip controls the changeover to leadscrew-controlled feed. After feed, rapid retract is also automatic.

Stroke on the drill is adjustable from ¼ to 4 in. and any part of the stroke can be used by adjusting both front and rear stops. The front stop controls hole depth to within 0.0005 in.

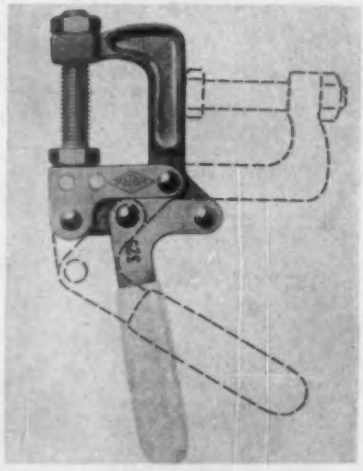
Thrust may be set for any value from 700 to 3,000 lb and, if an obstruction or damaged drill produces a thrust reaction higher than the set value, the drill will automatically retract and shut off.

Drill motor, rated at 1½ hp at 90 psig, provides power for speeds from 80 to 1,000 rpm and feeds of 0.0007 to 0.129 ipm.

Also introduced are Tru-Feed tappers which feature positive leadscrew feed, automatic operation, manual jog-tapping for hard or difficult materials, and portable or stationary mounts. The tappers handle taps up to 1-in. dia.

Gardner-Denver Co, Quincy, Ill

MORE DATA? Circle 84, inside back cover



Hold-Down Toggle Clamp Weighs 15 oz, Has 800-lb Grip Pressure

Medium-duty toggle clamp, Model 325, is designed especially for attachment to the sides of conveyors or containers and the edges of lids and covers.

The 15-oz clamp, which has a holding force of 800 lb, is made to be welded to these surfaces. Its jaw, or hold-down bar, is made of forged alloy-steel and moves 90 deg to clear the working area. The clamp has 17/64 holes in the base for special mounting and a plastic handle that moves 50 deg for one-hand operation.

Detroit Stamping Co, 330 Midland Ave, Detroit 3, Mich

MORE DATA? Circle 85, inside back cover

MICRO SWITCH Precision Switches

Actual size: 1.63 x 1.63 x 3.75

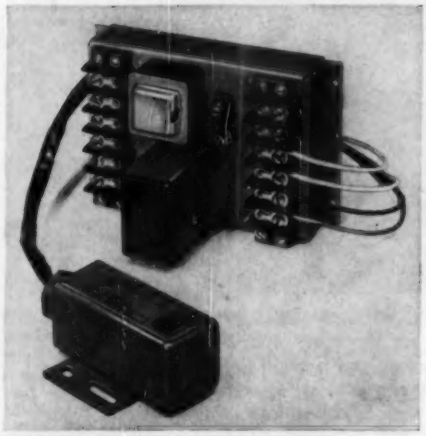
Detects without touching ...sensor never wears out!

Honeywell Proximity Switch detects metal within ½ inch of the sensor—over 600 operations a minute!

Protect your products and your budget! This amazing new switch is the perfect answer where rough parts or corrosive atmosphere may damage a mechanical switch, or where the delicate finish of a product may be marred by physical contact. And think of the savings you'll realize with a sensor that has no moving parts to wear out—a sensor that need *never* be replaced!

The Honeywell sensor has a rugged stainless steel face. The sensing unit is sealed against cutting oils, water and humidity, sand and dust; can operate submerged if necessary.

A Proximity Switch can be your answer to difficult switch problems, but be sure it is a product of Honeywell research. Contact the nearby MICRO SWITCH branch office and ask for Data Sheet No. 163.



Plug-in relay in amplifier cuts downtime. Amplifier is separate, may be remotely located.

MICRO SWITCH . . . FREEPORT, ILLINOIS . . . A division of Honeywell

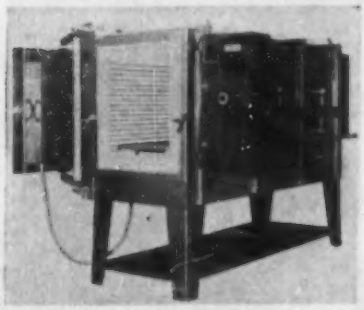
In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

Honeywell

MICRO SWITCH Precision Switches

HONEYWELL INTERNATIONAL

Sales and service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.



L & L Furnace Has Forced-Air Fans for 2 Temperature Ranges

With fans removed, the Model LP-2472H electric furnace has a temperature range of 300 to 2300 F; with forced convection fans installed, range is from 150 to 1875 F.

This wide range of temperatures makes the furnace suitable for heat-treating, drawing, glass annealing and many other jobs.

The new model incorporates features such as zone gradient control operated by multiple circuits (each circuit has its own input controller), and pyrometer and thermocouples to indicate gradients. In addition, elements are supported by specially designed holders which are said to give excellent heat transfer properties and low mass characteristic that keeps overshoot and undershoot of temperature to a minimum.

L & L Mfg Co, 804 Mulberry St, Upland, Chester, Pa

MORE DATA? Circle 86, inside back cover

New Granite Surface Plates Offered by Herman Stone

Crystal Pink granite surface plates contain aproximately 25% quartz. Because of the nonabrasive characteristics of the quartz crystals, accuracy of tools and instruments is preserved and wringing action is eliminated.

These plates are available in sizes from 8 x 12 in. to 10 x 15 ft. The smaller plates are provided with rubber shock-resistant legs for 3-point suspension. Larger plates can be equipped either with leveling wedges or air suspension controls to assure perfect level in critical installations. Manufacturer will also provide custom-made stands for all types and sizes of granite surface plates.

Herman Stone Co, 1860 N Gettysburg Ave, Dayton 27, Ohio

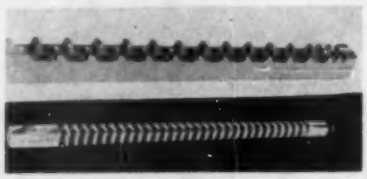
MORE DATA? Circle 87, inside back cover

Hydraulic Lift Table Designed For Lighter-Duty Jobs

Weld-Bilt Mighty-Midget offers several advantages in lighter-duty applications. Greater lifting ranges with tables of shorter overall dimensions are possible through method of mounting the lifting cylinders utilized in the design. Greater lifting speeds are also possible. Design also permits the construction of lifts of great stability, even with wide table surface areas. Unit illustrated is equipped with a turntable on top.

West Bend Equipment Corp, West Bend, Wis

MORE DATA? Circle 88, inside back cover



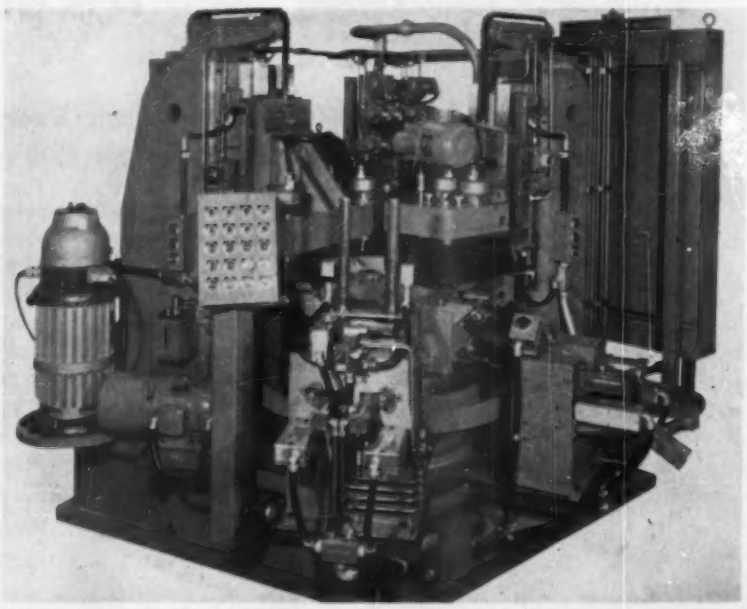
Square Broaches Offered As Standard Stock Items

Two new square broaches (top) have been added to the Minute Man line. These ⅞ and 1-in. sizes extend the standard sizes available to 19 ranging from ⅛ to 1 in. square. They are used in an arbor press to finish a square hole to exact size in a drilled, reamed, or cast bore in one pass.

Two high-speed broaches for cutting keyways by hand in an arbor press have also been added as stock items.

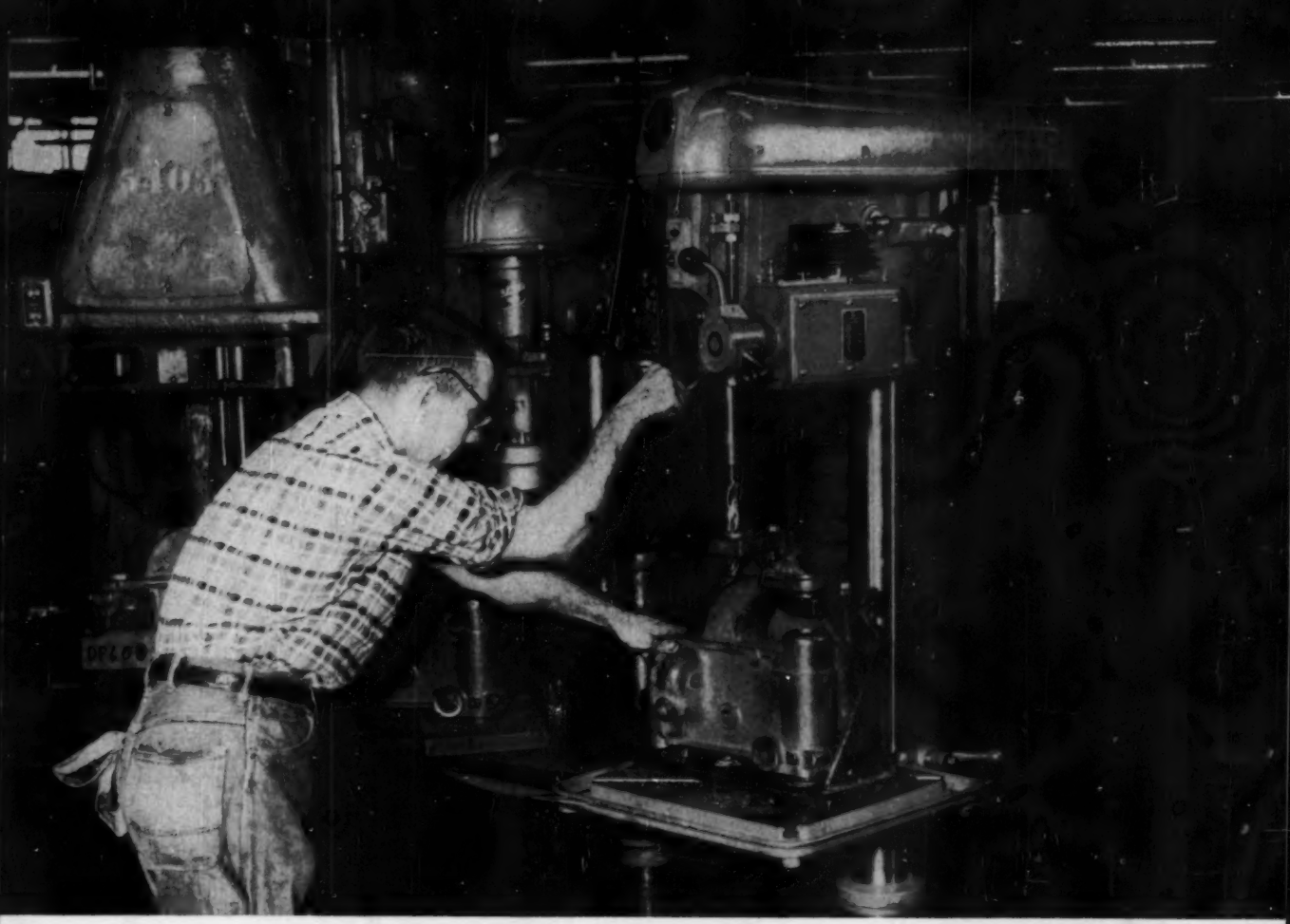
Du Mont Corp, Greenfield, Mass

MORE DATA? Circle 89, inside back cover

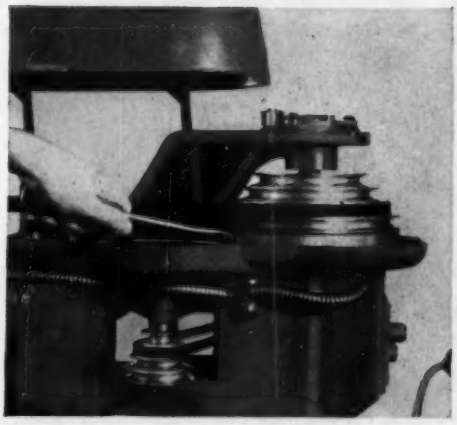


MACHINE ROUGH AND FINISH DIAMOND-REAMS a 0.295-in. dia hole and diamond face-grinds a 0.590-dia boss on the face of a sintered ferrite part. Two spindles accomplish the rough-reaming and two the finish-reaming in each of two parts. For the face-grinding, only one pass is required by the two grinding spindles which operate at 28,800 rpm, and oscillate as they grind. Total cycle time of the machine is 10 sec and with two parts per fixture, this adds up to 720 parts per hour—*Rehnberg-Jacobson Mfg Co, Rockford, Ill*

MORE DATA? Circle 90, inside back cover



2600 rpm or 110 rpm—you can do more with a Delta 20" *geared pulley head* drill press



All you have to do is turn a key to change from direct belt drive to gear drive on any one of the 28 models of this machine. The 20" geared pulley head drill presses can be used in manual as well as semi and fully automated set-ups to meet a variety of production needs.

FREE BROCHURE describes complete line of 20" drill presses in floor, bench, multiple spindle and overhead models. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 618FN. Lexington Ave., Pittsburgh 8, Pa.

You can drill and tap large holes, do spot facing, reaming and counter-boring at extra slow speeds because these drill presses have planetary gear spindle pulleys which reduce spindle speeds and multiply torque. Hand feed models offer ten speeds, five in direct drive and five in gear drive, while eight speeds are standard on power feed models. Use of a longer than standard belt adds eight more speed selections to either model.

These rugged flexible drill presses have the capacity to handle production metalworking jobs done by machines costing more than twice as much! See them in action and learn how they can help you cut drilling costs and improve drilling quality. Your Delta Industrial Distributor (listed under TOOLS or MACHINE TOOLS in the Yellow Pages) will give you the facts and figures.

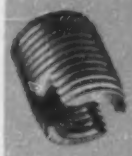
DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

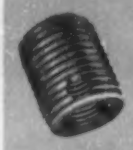
CIRCLE 319 READER SERVICE CARD

The quickest most practical way to put strong threads in soft materials the TAP-LOK® INSERT



SLOTTED

IN SOFTER METALS AND PLASTICS... Has full V-form external threads to provide maximum locking torque and permit wide choice of mating hole sizes. Recommended for soft aluminum, zinc die castings, sand castings and plastics. Meets requirements of MIL-MS-35914.



H-SERIES

FOR HIGHER STRENGTH MATERIALS... Has heavy wall and truncated root external thread and three-hole cutting edges for hard-to-tap higher-strength materials and to meet MIL and other specs calling for Class 3B thread fit for gaging after installation.

F-SERIES

ELIMINATES CHIPS... The F-Series Form-Lok self-tapping insert is thread forming and firmly locks itself in the base material. Available from stock in sizes #4 through ¼".

W-SERIES

FOR WOOD... Has coarse pitch external threads offering maximum strength in combination with ability to be driven into thin sections without splitting them. For furniture, cabinets and other wooden parts where strong, permanent threads are needed, or that are frequently assembled and disassembled.

SEE OUR CATALOG IN SWEET'S

Another fastener development from—

TAP-LOK / GROOV-PIN CORPORATION

1145 Hendricks Causeway, Ridgefield, N. J.

NEW SHOP EQUIPMENT

Wheel Dressing Tool Combines Traverse, Rotary Advantages

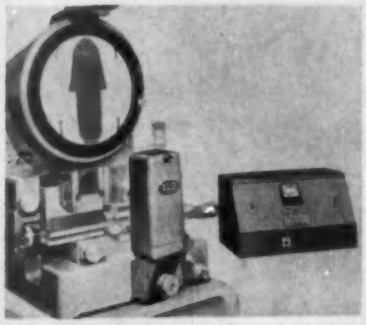
Independently-powered Tru-Grit rotary diamond-set traverse dressing wheel will achieve a controlled finish in the 30 to 55-RMS range and will also hold geometrical roundness of a part to within 0.0002 in. and taper-free straight surfaces to within 0.0002 in.

Prime use of the wheel dresser is in production of parts like auto valve stems that must hold a rough finish size without deviation from required tolerance limits on straightness and roundness.

In tests made by the manufacturer, the wheel has accomplished 10,930 dressings before removal with a finish, roundness, and surface-accuracy within the above limits.

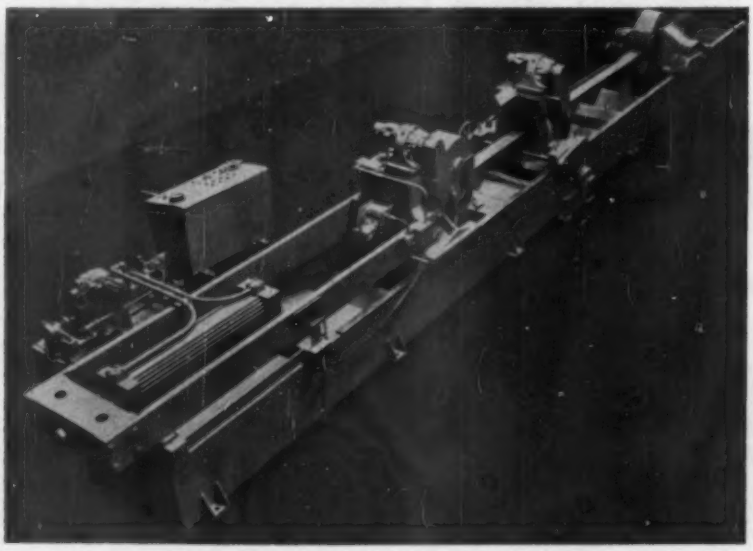
Wheel Trueing Tool Co, Detroit, Mich

MORE DATA? Circle 91, inside back cover



MERCURY ARC LIGHT with an intrinsic brightness 45 times that of a standard tungsten filament is available for contour projectors. The light is recommended for magnifications of 20X and over on 14-in. projectors and 50X and over on 30-in. projectors. It can be set at low intensity for lower magnifiactions — *Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit, Mich*

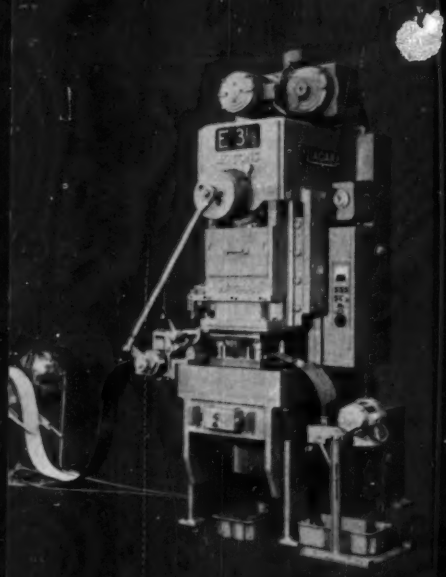
MORE DATA? Circle 92, inside back cover



HYDRAULIC STRETCHER-TWISTER shapes 30-ft aircraft and similar spar sections with a 400,000-lb stretching capacity and a 200,000 in.-lb torque capacity. Stretching speed range is infinite up to 25 in. per min. Twisting is performed at ¼ rpm. An intermediate head is movable along the entire bed of the machine so that it can be engaged at any point of the spar to twist or detwist portions of the spar. With this head two or more different helix angles can be produced on the same spar—*Loma Machine Mfg Co, Inc, 114 E 32 St, New York 16, NY*

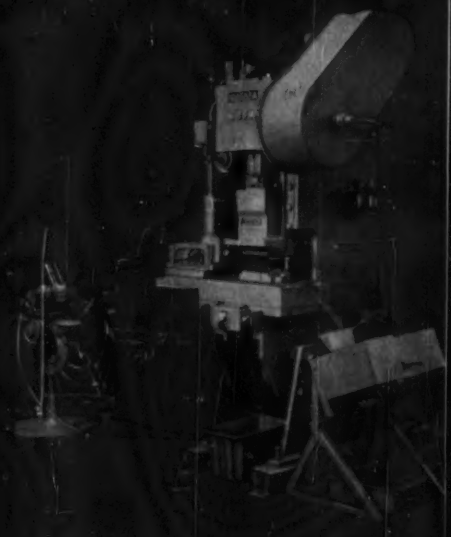
MORE DATA? Circle 93, inside back cover

PRECISION PARTS BY THE MILLIONS



SERIES E — FRONT-TO-BACK CRANKSHAFT OBI's
Capacities: 45 to 200 tons.
45-ton model (above) stamps out fuse tips at rate of million/day.

SERIES SA-2 STRAIGHTSIDE AUTOMATICS
Capacities: 25 to 300 tons.
100-ton package (above) includes double roll feed, stock reel, scrap cutter.



SERIES M — ULTRA-HIGH SPEED OBI's
Capacities: 22 to 60 tons.
35-ton model shown operates at adjustable speeds up to 1000 spm and produces parts at rate of million/day.

3 great Niagara lines excel in automatic, high speed, progressive die work

Premium construction: It's the key to premium performance here! These modern Niagara presses are designed strictly for automatic, high speed, progressive die work.

Model for model, they'll turn out more parts per hour than conventional presses of equivalent tonnage can even approach. Far heavier and more massive, they have the ruggedness, rigidity, and stamina to run vibration-free at high speeds.

Providing more guiding surface, their gibbing holds slide and bed in precise alignment for precise production, longer periods between die grinds, and longest possible die life.

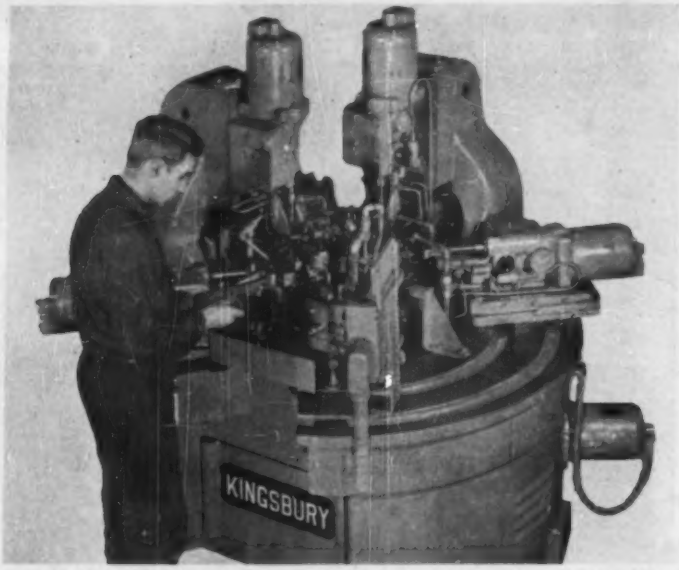
But this just begins to tell the story . . .

YOU'RE INVITED TO CHECK all the features of these production-boosting machines. Illustrated Bulletins 54 (Series M), 56 (Series E), and 264 (Series SA-2), will be mailed on request. Write: Niagara Machine & Tool Works, Buffalo 11, N. Y.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE 321 READER SERVICE CARD



SEVEN UNITS DRILL AND REAM carriage blocks used in fishing tackle at a gross rate of 1000 parts per hr. A stationary cam on the center stud of the machine causes the machine's eight work fixtures to clamp as they index away from the loading station and unclamp as they index to the ejection station. Small workpieces have a 0.2045-in. hole drilled and reamed by two vertical units and four holes from 0.073 to 0.188-in. dia drilled and reamed by five horizontal units—*Kingsbury Machine Tool Corp, Keene, NH*

MORE DATA? Circle 94, inside back cover

SIP Repeat Control Plays Back Coordinates From Memory Drums

The DIR automatic repeater incorporates twin memory drums to give SIP Hydroptic 6A and 7A jig borers and milling machines x and y axis automatic repeat control. To set up the control, an operator runs the machine through an operation on the first of a run of parts. At each position he moves a selector to the number of the operation that he is performing and presses a record button. When all the coordinates for machining the part have been recorded on the drums (each memory drum will record up to 20 coordinates) the operator returns the selector to the first position and presses the repeat button. Spindle saddle and table will then move simultaneously to the first coordinate.

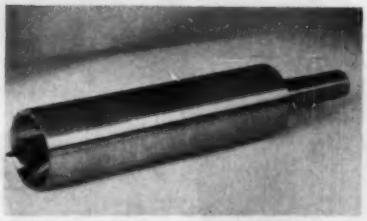
Positioning control uses three slow-downs when approaching a coordinate position, and final positioning—within 0.02 in. of stop position—is controlled by a photoelectric microscope that senses graduations on standard scale and sends signals to a servo motor.

These microscopic readings are also projected onto screens so that

the operator can check the settings at any time during the machining operation.

American SIP Corp, 100 E 42 St, New York 17, NY

MORE DATA? Circle 95, inside back cover



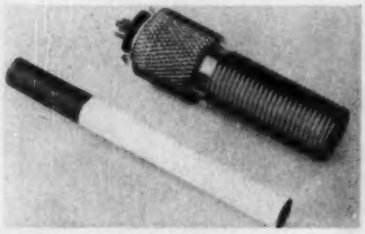
Tool Self-Centers and Drills Stock for Grinding, Machining

Round, square or rectangular stock can be self-centered and center-drilled for machining and grinding with this tool because the nose piece is funnel shaped. The tool is spring loaded and the outer housing holds the stock firmly in position as pressure from the spring is forced against the stock. In a lathe, the outer housing rotates with the work while the inner shaft which houses the center drill is locked in the tail stock and does not rotate. In a drill press the outer housing is stationary and the shaft rotates.

The tool can also be used for center drilling, center reaming, or pipe reaming.

The Raymond Paslawsky Co, 201 Morehouse Highway, Fairfield, Conn

MORE DATA? Circle 96, inside back cover

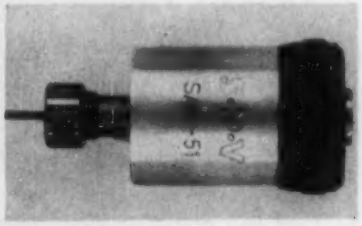


Magnetic Pickup Has Variety of Applications

The Kineflux magnetic pickup, which generates a voltage or frequency from mechanical motion without contact, can be used for measuring speed, counting revolutions, reversing the direction of motion, speed control, proximity detection, and as a tachometer element. It employs a dc magnetizing coil and separate output coil. By removing the dc when no output is required, no magnetic force coupling exists between the pickup and the moving element (a rotating ferous gear, for instance). Engineering data sheet is available on request.

Kinelogic Corp, 1256 N Fair Oaks Ave, Pasadena, Calif

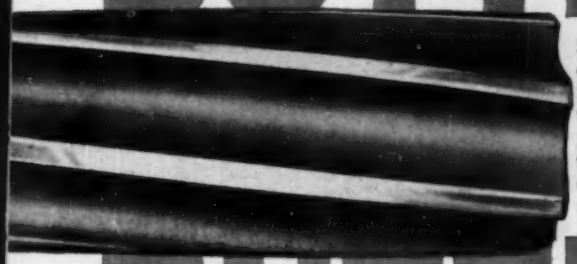
MORE DATA? Circle 97, inside back cover



REVERSIBLE TAPPER for Burgmaster drills, designated the SPV tapping attachment, type SAR-51, covers thread sizes from No. 0 to No. 8. The attachment features ball-type drive which is said to give very high thread quality — *Homestrand Machine Tool Corp, 392 West Putnam Ave, Greenwich, Conn*

MORE DATA? Circle 98, inside back cover

BUTTERFIELD
BUTTERFIELD



Sharing the proved performance and long life engineered into the complete Butterfield line, Butterfield reamers cut freely and size holes accurately and uniformly—when used alone or in multiple tool machining. Butterfield production performance like this, plus prompt deliveries and expert technical aid, will reach your plant fast . . . wherever it's located, whatever you machine . . . Call your Butterfield Distributor today. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

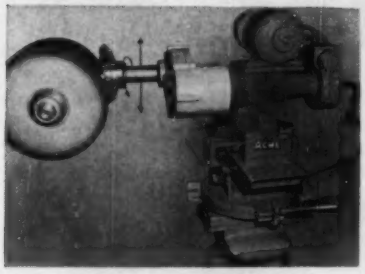
BUTTERFIELD
BUTTERFIELD

Division, Union Twist Drill Company, Derby Line, Vt.

For the deepest draws on the toughest metals

Johnson's 700 WAX-DRAW does every draw in the shop. *Easy to apply* by roller coating, spraying, dipping, etc. Use wet or dry. Blanks can be fed directly into the press or may be pre-coated, dried and palletized. *Easy to remove,* using solvent bath, vapor degreaser, alkaline washer or even hot water alone. *Money saving.* One gallon undiluted covers 2,000 square feet. Four-to-one dilutions produce excellent results. 700 Wax Draw handles multiple draws with only one application even at pressures to 200,000 p.s.i. and temperatures to 450°F.

For further information write: **JOHNSON'S WAX** Racine, Wisconsin, Dept. AM-6.



Oscillating Attachment Permits Mush Buffing of Recessed Parts

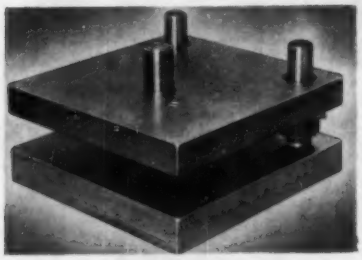
This new vertical oscillating attachment is easily installed on this semi-automatic buffing machine to allow mush or slough type buffing of recessed or contoured parts.

Recommended for finishing parts such as deep, irregularly-shaped die castings, hub cap wheel spinners, horn rings, and emblems with deep recesses, the attachment mounts directly to the main spindle housing of Acme semi-automatic machines and simultaneously rotates a part and moves it vertically above and below the center height of the buffing wheel. This gives greater contact area and allows the wheel to mush into depressions and around part contours.

Maximum stroke of the eccentric-gear-driven attachment is 6 in.

Acme Mfg Co, 1400 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 99, inside back cover

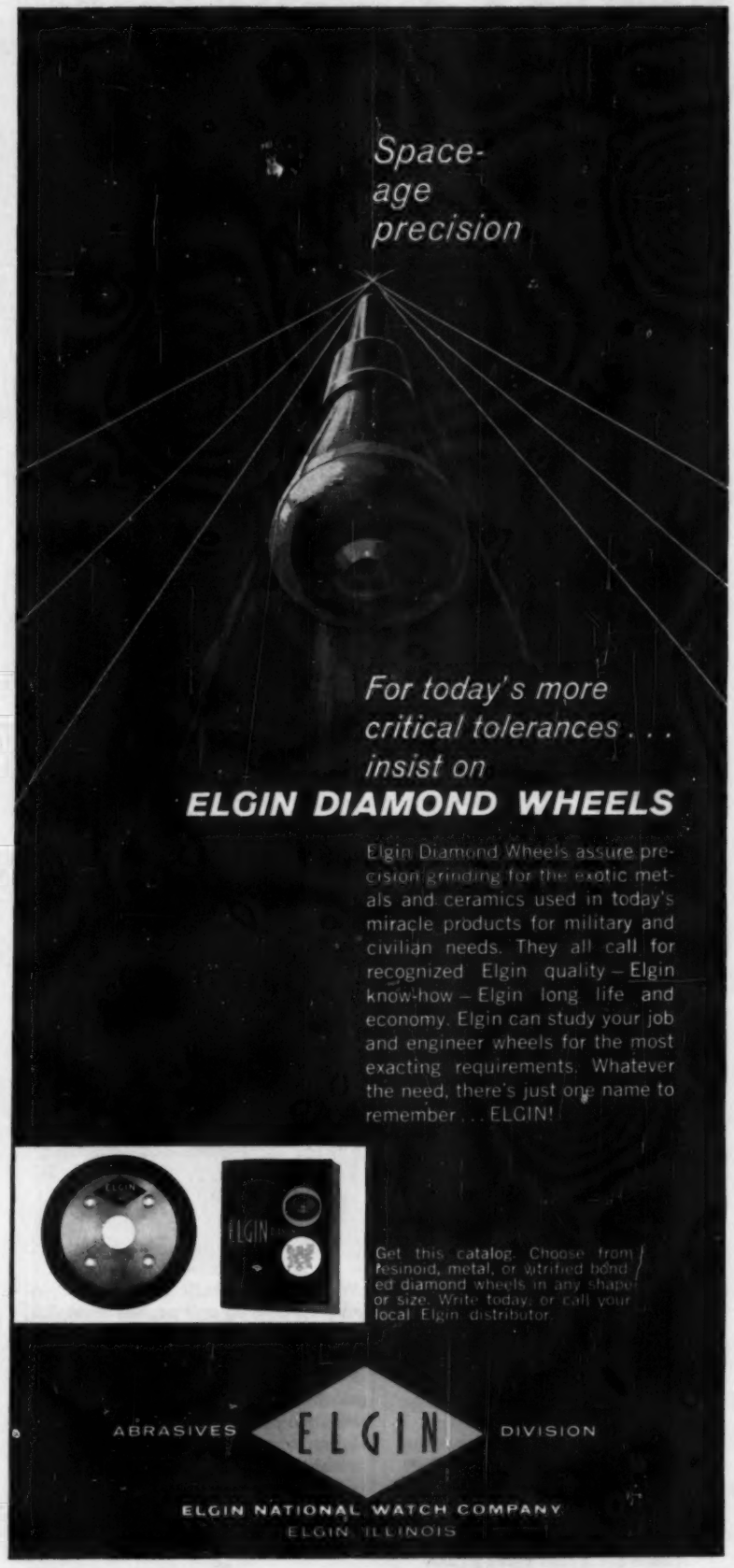


All-Steel Diesets Offered in New Line

Econoline consists of 216 different combinations of sizes and thicknesses in standard models. They are manufactured as high grade commercial sets suitable for most precision requirements. Torch-cut from prime plate, completely normalized and surface-ground, the diesets are equipped with Lamina steel shoulder bushings hardened and honed and complete with grease fittings, and Lamina tool steel guide pins.

Wheatley Economy Die Sets Inc, 1627 W Fort St, Detroit 16, Mich

MORE DATA? Circle 100, inside back cover


Space-
age
precision
For today's more
critical tolerances . . .
insist on
ELGIN DIAMOND WHEELS
Elgin Diamond Wheels assure precision grinding for the exotic metals and ceramics used in today's miracle products for military and civilian needs. They all call for recognized Elgin quality – Elgin know-how – Elgin long life and economy. Elgin can study your job and engineer wheels for the most exacting requirements. Whatever the need, there's just one name to remember . . . ELGIN!
Get this catalog. Choose from resinoid, metal, or vitrified bonded diamond wheels in any shape or size. Write today, or call your local Elgin distributor.
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IF

you manufacture:

Air conditioning, appliances, electronic, communications, electrical apparatus, fans, blowers, machine tools, materials handling, panelboards and switch boards, prime mover, pumps, compressors and general machinery . . .

these Westinghouse products are tailored for you

On these pages are shown some of the many components developed and manufactured by Westinghouse specifically for OEMs. Here is one single source for technical assistance, manufacturing and stocking of all of your electrical needs. Use this *total* service to solve your design and manufacturing problems now. Call your local Westinghouse Sales Engineer or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-00103

Westinghouse

NEW

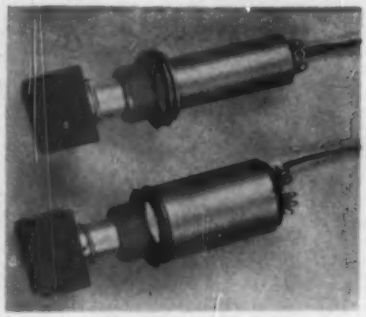
Black Line control transformers

Especially designed for machine tool control. Compact design plus Westinghouse's exclusive "BONDAR" Class "A" insulation combines quality and minimum space in Black Line Transformers. Offered in a wide range of voltage ratings—.025 kva through 5 kva with a 55° C. rise. For details, write for Bulletin B-7879 to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-00170

CIRCLE 326 READER SERVICE CARD

NEW SHOP EQUIPMENT



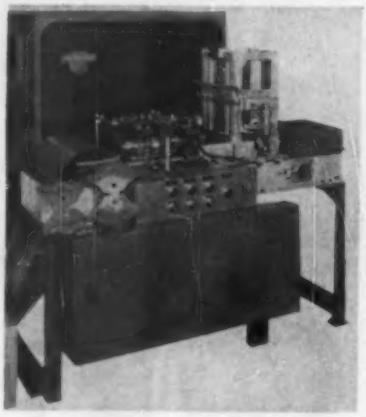
Keyboard Switchlight Series Are Solenoid Hold-Down Type

Series are offered in various circuit and contact arrangements from SPST to 6PST and SPDT to 8PDT, each with independent lamp circuits. When the solenoid hold-down switch is actuated, the coil is energized and holds the pushbutton down in the IN position where it remains until the coil is remotely de-energized thereby releasing to the OUT position. When coil is not energized, switching action is momentary.

Switches are rated at 28 v dc, 50 ma to 2 amp with silver contacts and ¼ to 50 ma with gold contacts. Holding force is 1½ lb; plunger travel, 3/16 in.

Pendar Inc, 14744 Arminta St, Van Nuys, Calif

MORE DATA? Circle 101, inside back cover



WORK TABLE FOR THERMONIC induction heating unit permits annealing of four sections of two different-sized steel auto-body plates at a production rate of 3½ sec per plate. The machine heats five sq in. of the 1020-HR steel plates to 1400 F. Non-skilled labor can operate the table, which consists of an automatic hopper, indexing conveyor, and work coil.—*Induction Heating Corp, Brooklyn, NY*

MORE DATA? Circle 102, inside back cover

NEW

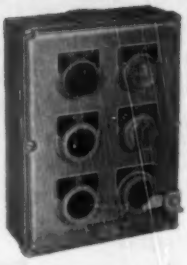
BF relay

Saves space, cuts cost, is specially engineered for machine tools. 50% less space, front accessible terminals, low temperature operation, lower installed cost, long life. In both 4-pole and 8-pole frames, rated at full load current of 6 amps/300 volts a-c 60 amp inrush. Write for Bulletin B-7345, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-00165

Westinghouse

NEW



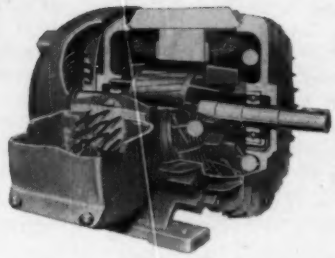
Oil-Tite pushbuttons

Simple, rugged, contamination-proof. Flush oil-tite pushbuttons with minimum projection keep oil, coolant, cutting oil or water from contacts. Wide variety of head types and interchangeable color caps make this one of the most flexible lines of pushbuttons available today. Write for Bulletin B-7321, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-00166

CIRCLE 327 READER SERVICE CARD

NEW



Guardistor motors

Guaranteed against burnout due to overheating from any cause! Exclusive static-semiconductors imbedded in windings respond with snap action *only* when windings reach critical temperature. Anticipated nuisance trips are avoided. Use full rated hp safely. Available for any size motor. Write for Bulletin B-7876 to Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96171

Westinghouse

NEW

AVR adjustable speed drives

Static design, less floor space, easy installation, flexible. System converts a-c to d-c to operate an adjustable speed d-c motor. Includes a power unit, main d-c drive motor and operator's control station. Available from 1 to 200 hp or larger. Write for Bulletin 5601 to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96172

CIRCLE 328 READER SERVICE CARD

NEW SHOP EQUIPMENT

Air Impact Wrench Features Controllable Torque Delivery

Model W-37 is a ½-in. square drive unit that incorporates an oscillating impact mechanism. Complete elimination of the conventional rotary air motor permits torque output to be controlled from trigger to mechanism through an infinite range from a light rotary tap to a heavy impact blow.

In addition to providing greater power and control, the oscillating construction eliminates the chipping and breaking down of hammer and anvil surfaces as a result of partial engagement impact blows. Wrench is nominallly rated at ⅜-in. bolt size capacity, with ½-in. square drive standard and 7/16-in. hexagon ball lock spindle (W-37S) optional. *Thor Power Tool Co, Aurora, Ill*

MORE DATA? Circle 103, inside back cover

UNIPOL LAPPING AND POLISHING machine incorporates an 80 to 1200-rpm variable-speed control and a ½-hp dc motor for constant torque at all loads. Vibration and rollout are said to be virtually eliminated by wide track bearings. The cover, pan, lap, and polishing wheel can be completely changed in 5 seconds, and grinding and polishing can reportedly be done with the same unit without danger of contamination — *Geoscience Instruments Corp, 142 Maiden Lane, New York 38 NY*

MORE DATA? Circle 104, inside back cover

NEW

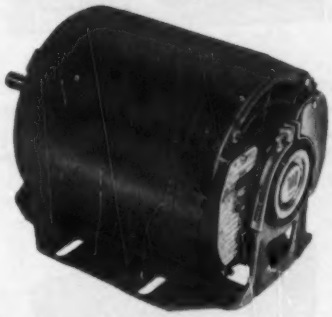
Rectiflow adjustable speed drives

Economical, simple, reliable, over 3:1 speed range or higher, inherent constant hp characteristics. 20 hp to 600 hp in open and totally enclosed air-cooled designs. Inherent fast response and close speed regulators make this drive a natural for a wide variety of machine tool applications. For more information, write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96169

Westinghouse

MOTORS

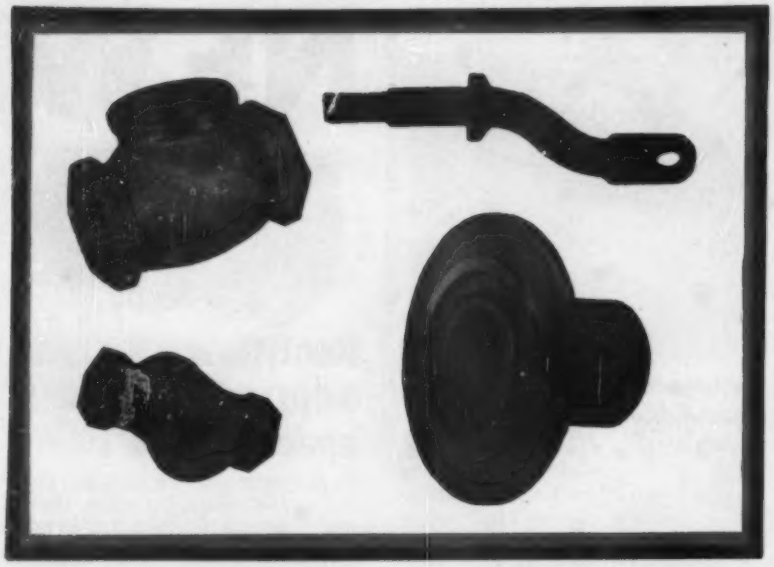


fractional hp

Operates 25,000 hours without re-oiling on light duty applications, uses specially designed sleeve bearing lubrication system. Over 550 motor styles rated ⅛ to 1 hp in variety of combinations of mechanical features are stocked by Westinghouse at all times to meet your instant needs. Write for Bulletins 2820 and 2850 to Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*

J-96173

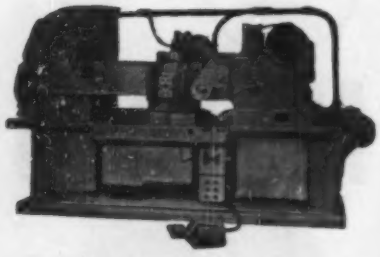
CIRCLE 329 READER SERVICE CARD



PARTS LIKE THESE and MANY OTHERS ARE BEING PRODUCED

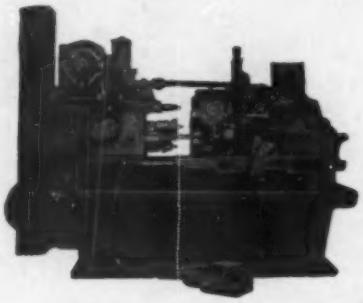
with speed, convenience and economy...

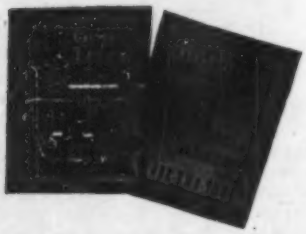
on GOSS & DeLEEUW AUTOMATIC CHUCKERS



THE "ONE-TWO-THREE" 7 - SPINDLE TOOL ROTATING CHUCKING MACHINE can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.

4-SPINDLE TOOL ROTATING CHUCKING MACHINES available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended parts.





Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

NEW SHOP EQUIPMENT

Press overload detector instantly disengages press clutch in the event of misfeed, stock buckling, or the end of a feed coil. The unit will release the clutch solenoid within one cycle following an overload. Sensitivity of the electrically controlled system may be decreased with the increase of material thickness, and it can be used with any basic model Di-Matic press control of the 100 or 200 series —*Di-Matic Controls, Inc, 100 Beadel St, Brooklyn 22, NY*

MORE DATA? Circle 105, inside back cover

Circular saw blades are available in Economy Packs each of which contains 10 diamond arbor combination blades. Packs are furnished in three blade diameters, 6½, 7¼ and 8¼ in. and priced at $23.50, $23.50, and $26.87 respectively—*Skil Corp, 5033 Elston Ave, Chicago 30, Ill*

MORE DATA? Circle 106, inside back cover

Positive rake holders added to Dex-A-Tool line of throw-away insert toolholders are available in RH and LH models in a variety of styles and shank sizes.

Holders feature an adjustable carbide-faced combination chipbreaker clamp that has buttress-type serration and a set screw located at the rear to permit rapid relocation after indexing or replacing the insert. Thick, indexable and replacable carbide anvil provides extra rigidity and insert support—*Adamas Carbide Corp, Kenilworth, NJ*

MORE DATA? Circle 107, inside back cover

Series C general purpose air power cylinders are available in 1¼, 1¾, 2½, and 3⅝, and 4½-in. bore sizes with standard strokes to 20 in. Single and double rod end models are offered and floating cushions that will reduce stroke impact can be furnished or installed in the field without increasing overall length—*Hennafin Co, Dept 518, 501 S Wolf Rd, Des Plaines, Ill*

MORE DATA? Circle 108, inside back cover

Miniature pushbutton enclosures are designed for all standard makes of miniature pushbuttons, switches and pilot lights. Made of 14-gage steel with a removable cover and neoprene gasket, they are said to give double the control capacity in the same area as with standard enclosures — *McKinstry Metal Works, Inc, 285 McKinstry Ave, Chicopee, Mass* •

MORE DATA? Circle 109, inside back cover

Linde Coatings & materials News

LINDE COMPANY, DIVISION OF UNION CARBIDE CORPORATION

Surgical shears get longer life with LINDE tungsten carbide coating

Surgical shears with tungsten carbide coated on working surfaces now lose their cutting edge about *one-third* as fast as conventional shears. This has been proven under rigid testing supervised by a leading research laboratory.

The American Medical Instrument Corporation, Flushing, New York, uses the LINDE Flame-Plating process to improve the working surface and increase the wear-resistance properties of shears produced under its *Tuncarb* trade-mark.

The process has increased cutting life to the extent that *Tuncarb* shears in use for more than a year have not as yet been returned to AMICO for sharpening. By comparison, regular surgical shears used under the same conditions had to be returned as many as three times for restoration of working surfaces.

Coatings only .004" thick

AMICO ships hot-drop-forged stainless steel parts to LINDE's new Flame-Plating plant at North Haven, Conn. Here, via the LINDE developed coating process, a .004" thickness of tungsten carbide is actually "welded" to the precision wear surfaces of the instruments.

After coating, the blades and jaws are assembled, riveted, ground, polished, and buffed to a high finish by AMICO. The tungsten carbide surfaces themselves are finished with only a slight brushing. The same process is used to coat *Tuncarb* needle holders to provide tungsten jaws that give a firm grip on needles.

High-speed "blast-on"

The heart of LINDE's coating process is the LINDE Flame-Plating gun, into which exact quantities of oxygen, acetylene, and tungsten carbide or other powdered materials are fed by a special mechanism. After the gun is aimed at the area to be coated, controlled detonations "blast" the particles onto the work piece at speeds up to 2500 fps—until the desired coating thickness is reached.

Although temperatures of about 6000° F are attained within the detonation gun to heat powder to plastic state, the work piece itself is always kept below 400° F during the operation. There are no changes in the properties of the base metal and no distortion of the work piece regardless of its minuteness.

The inside cutting surface of the *Tuncarb* surgical shears shown here have been coated with tungsten carbide, reducing their rate of wear by as much as one-third.

In some uses, depending on the thickness of finish, the LINDE Flame-Plating process has been known to multiply wear resistance of metal parts by as much as 40 times.

For complete information on how you might use this advanced method of coating metals to improve production or reduce operating costs, check and send the coupon below.

LINDE synthetic sapphire solves guide problem in tape recorders

Second only to the diamond in hardness, LINDE synthetic sapphire provides unique wear-resisting characteristics. Because of its extremely low friction, hardness, and physical and chemical stability, several large manufacturers are using LINDE synthetic sapphire to solve the wear problem in tape guides on airborne and high-reliability tape decks, as well as in photographic film guides.

In these areas—where hardened steel guides show friction and wear almost immediately—sapphire wear is nearly imperceptible even after 100 hours of operation.

LINDE flame-polished synthetic sapphire is a convenient material for preventing edge-cutting typical with certain tapes in top and bottom guides.

For details on LINDE synthetic sapphire for any type of wear guide, instrument bearing, or other critical application, check and mail the coupon.

Chromium polished to maximum lustre with LINDE abrasives

In certain applications where it is necessary to achieve an extremely smooth surface on chromium finishes, such as in photographic rolls and processing rolls in the plastics industry, LINDE alumina abrasive powders of 99.98% purity have demonstrated unusual efficiency in removing the most minute protuberances.

Several leading photographic and precision parts manufacturers use LINDE abrasives, not only to obtain high-lustre finishes that protect materials, but also to refinish rolls several times over to avoid frequent replating.

Grades of LINDE alumina powders in sub-micron sizes are available for several cutting speeds or types of finish. For information, use the coupon below.

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270 Park Avenue
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Please send details on the items checked:

- ☐ LINDE Flame-Plating
- ☐ LINDE Synthetic Sapphire
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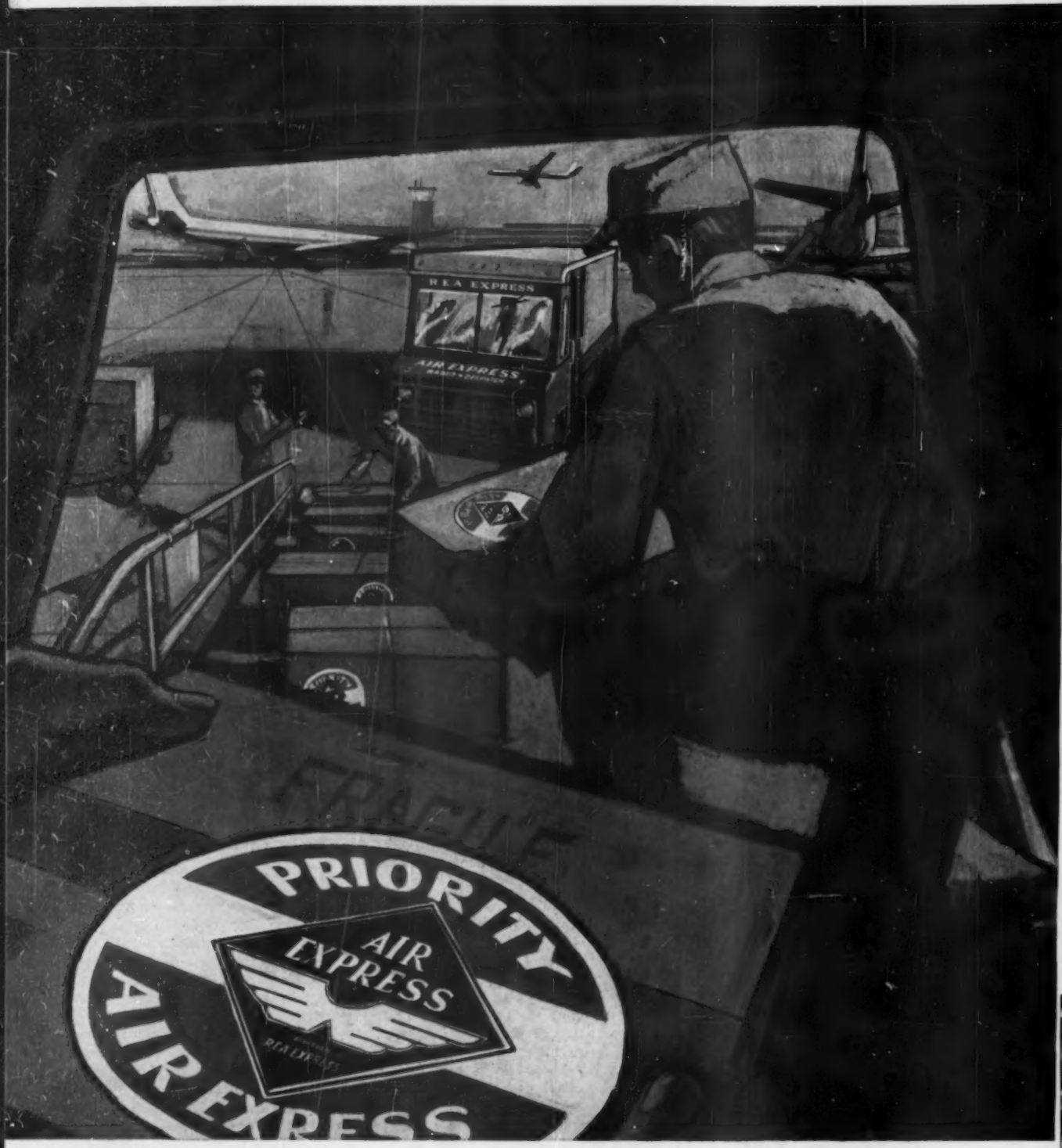

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Ever wonder how the loading crews at the airport handle shipments bearing the red, white, and blue AIR EXPRESS label? Gently — with real kid-glove handling. Fast, too. In fact, of all packages, they're first on, first off. Special AIR EXPRESS trucks (there are 13,000 of them) come and go throughout the day. Their job is to pick up and deliver door-to-door at both ends of the flights. Does this give you any ideas about your own shipping problems? Then call AIR EXPRESS and find out how little it costs to put this skilled shipping team to work for your company. Once you do, you will always think AIR EXPRESS first! Call now.

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CIRCLE 332 READER SERVICE CARD

Eaton Acquires Major Interest In Italian Engine Valve Firm

Eaton Manufacturing Co of Cleveland has made its initial entry into the European Common Market as a prime manufacturer. Company has acquired, for cash, a majority interest in a newly organized Italian firm, Eaton Livia S P A, which has purchased the business and most of the assets of Officine Sant' Ambrogio S P A of Turin. This company, an exclusive licensee of Eaton in engine valves for the past eight years, is the largest independent manufacturer of automotive engine valves in Italy, and one of the largest in the Common Market.

Eaton, which plans a further expansion in engine valve production at the subsidiary, will also be in a position to introduce other company-developed products to its Italian manufacturing facility.

$4 Million RCA Plant Opened

Radio Corp of America has opened its new electronic computer facility near West Palm Beach, Fla. Plant, which turns out the RCA 301 computer, currently employs 500; this figure is expected to jump to around 1000 by year's end.

National Screw Buys Into French Fastener Firm

Controlling interest in the largest manufacturer of industrial fasteners in France has been purchased by National Screw & Manufacturing Co of Cleveland, maker of the most complete line of fasteners in the US.

Substantial new capital will be invested in the company, Forges et Boulonneries Hermant Hicguet et d'Ars-sur-Moselle, which employs 850 and has executive offices in Paris. Manufacturing capacity of both plants of Hicguet will be expanded and the product line broadened. National purchased 51% interest in the company and substantial minority interests are held by two large French steel firms which supply raw materials to Hicguet. Both plants of the French concern make special stampings and forgings in addition to fasteners.

Precision grinding machine is exhibited by Churchill Machine Tool Co at the British Trade Fair held in Moscow this month. Most successful commercial fair ever held in the Soviet Union, it was attended by representatives of 725 exhibitors and viewed by more than 1,250,000 Soviet citizens during its 17-day session. According to some estimates, almost 20% of the equipment exhibited was produced in the United Kingdom either under license from America or by English affiliates of American and Canadian firms

Waterbury Farrel Expansion

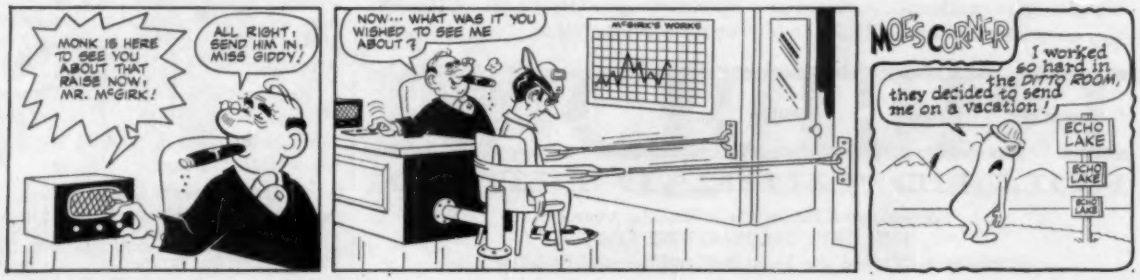
The 110-year-old Waterbury Farrel Foundry & Machine Co, a division of Textron Inc, is now operating in a new seven-bay, 314,000 sq-ft facility recently completed in Cheshire, Conn, ten miles from its old Waterbury headquarters. Company produces cold heading machines, presses, and rolling mills including the Sendzimir mills used for precision cold rolling of stainless steel and hard alloys and now for rolling of the new extra thin steel tinplate.

New one-story plant replaces a century-old, multi-story, multi-building facility. Although there's approximately 20% less floor space in the new production plant, it has the capacity to handle 20% more volume.

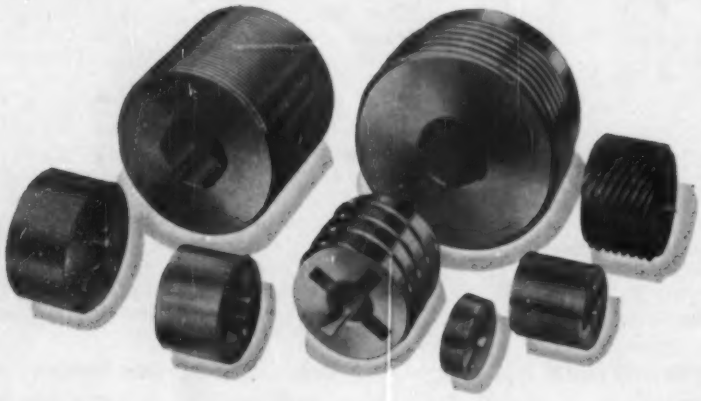
United Welders' New Division

United Machines & Engineering Inc has been formed as a new division in Fort Smith, Ark, by United Welders, Bay City, Mich. It'll specialize in design and fabrication of equipment for handling and transfer of in-process workpieces, plastics part manufacturing, application of chemical-foam insulation, and special machining operations. All equipment

McGIRK'S WORKS


MONK IS HERE TO SEE YOU ABOUT THAT RAISE NOW, MR. McGIRK!
ALL RIGHT, SEND HIM IN, MISS GIDDY!
NOW··· WHAT WAS IT YOU WISHED TO SEE ME ABOUT?
McGIRK'S WORKS
MOE'S CORNER
I worked so hard in the DITTO ROOM, they decided to send me on a vacation!
ECHO LAKE
ECHO LAKE
ECHO LAKE

More Can Be Done



With Reed Cylindrical Dies!

Reed thread and form rolling dies meet the widest range of applications — give you significant advantages with improved performance and reduced operating costs. Manufactured under the strictest standards of quality control, they're uniform . . . durable . . . accurate and available for two die or three die machines of all makes. Over 130 sizes regularly stocked . . . plus non-standard cylindrical dies on special order.

Let Reed, pioneer-leader in the development of all types of thread rolling equipment, help you get maximum production on all thread or form rolling jobs.

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ROLLED THREAD DIE CO.

Subsidiary of Union Twist Drill Company
HOLDEN, MASSACHUSETTS
Specialists in Thread and Form Rolling Tools and Equipment

will be highly automatic. General offices, engineering department, and building areas are being included in a new plant now being constructed on an 8-acre tract in the area.

Contracts . . . All Kinds, Sizes

Philco Corp's Government and Industrial Group, Philadelphia, has a $35.8 million order for continued development of command and control subsystems for Air Force space and satellite programs.

Bath Iron Works Corp, Bath, Me. has a $58.7 million contract from the Navy for construction of three guided missile frigates.

Avco Corp's Lycoming Division, Stratford, Conn, will work on AF orders totaling $18 million for additional production and support activities for its T53 and T55 gas turbine engines.

Pullman Standard Division of Pullman Inc, Chicago, has an $8 million contract to supply 53 electrically powered coaches to the New York Central RR. It'll also furnish the Louisville & Nashville RR with 590 new hopper cars.

LeTourneau-Westinghouse, Peoria, Ill, has a $9 million order from the Army for production of 230 amphibious vehicles.

Saco-Lowell Shops, Boston division of Maremont Corp, will produce $7 million worth of M-60 machine guns for Army Ordnance.

Fairchild Stratos Corp, Hagerstown, Md, has received an Army contract totaling $7.8 million for three drone surveillance systems.

General Electric's Missile and Space Vehicle Department, Philadelphia, has a $13 million AF order for servicing and installing equipment for missile re-entry vehicles at nine Atlas ICBM bases. It'll also work on a $6 million contract from Grumman Aircraft to develop a satellite control system for the Space Administration's orbiting astronomical observatory.

Studebaker-Packard Corp, South Bend, Ind, has received a $21.4 million prime contract to supply heavy-duty military trucks to the Army Ordnance Corps.

Bendix Corp's Radio Div, Towson, Md, has a Signal Corps order amounting to $10 million for work of a highly classified nature.

Chrysler Corp's Dodge Truck Assembly Plant will work on a $10 million contract for production of 2400 M-37 military trucks.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 THREAD ROLLING AND FORMING MACHINE — *Landis Machine Co, Waynesboro, Pa.* 10-page bulletin E-104 pictures and describes features of the Hy-Duty, a two die machine for operations requiring rolling pressures of 50,000 to 200,000 lb. Infeed range is up to 6-in. nominal maximum diameter, throughfeed is up to 4 in. in bar lengths. Hydraulically operated infeed system allows cycling rates up to 25 spm (fully automatic). Speed range is from 39 to 486 rpm. Thread lengths are: infeed, up to 11½ in.; throughfeed, up to 20 ft.

2 HORN PRESSES — *Federal Warco Division, McKay Machine Co, Warren, Ohio.* 12-page illustrated bulletin 52171 provides information on 5-model line with capacities from 60 to 200 tons and 30 to 50 spm. General specifications, crank shaft capacities, engineering drawings included.

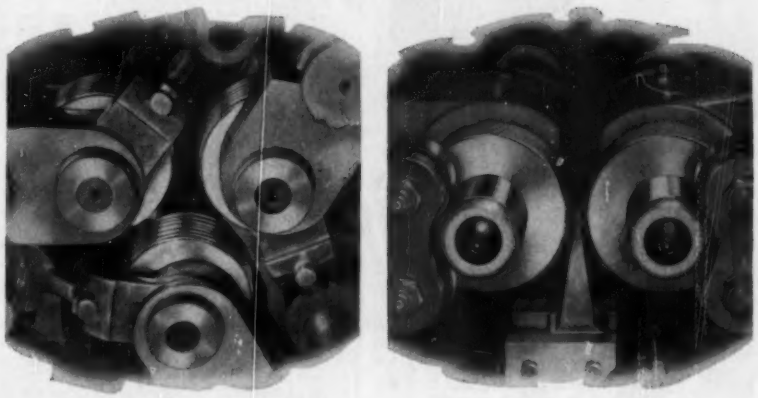
3 HIGH SPEED PRODUCTION MILLING—*Automatic Mill Inc, Danbury Industrial Park, Danbury, Conn.* 4-page brochure gives details on the Automatic-Mill for automating milling work. It employs a powerful chain drive to continuously move a matched set of hardened holding fixtures through precision locating rails at variable speeds to permit 250 to 6000 parts to be machined in an hour. This workholding device can be clamped to the bed of a horizontal or vertical milling machine.

4 7-IN. GRINDER — *Walker-Turner Division, Rockwell Manufacturing Co, 400 N Lexington Ave, Pittsburgh 8, Pa.* Bulletin illustrates and describes improved model. New features include Twin-Lite safety shields, removable steel plates covering the sides of the wheels, thin-line ½-hp motor with extra-long shaft and oval end bell hubs.

5 400-TON DIE CASTING MACHINE —*Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio.* 6-page bulletin 461 covers Model 400 high pressure hydraulic unit available either as a hot chamber machine for casting zinc, lead, or tin alloys, or as a cold chamber unit for aluminum, brass, or magnesium alloys. It has 40½-in. (vertical) and 40-in. (horizontal) size die plates.

"Whoooey! That's quite a gadget you installed on the time clock for those who punch in late."

More Can Be Done



With Reed Thread Rolling Machines!

Threads on hollow parts...heavy parts . . . tapered threads close to shoulders . . . *You* name it. Reed machines form them all! And with ease, accuracy and uniformity!

Whether you require vertical or horizontal machines — two die or three die type — adapted to both in-feed and thru-feed — Reed can meet your specific needs. And Reed machine flexibility permits economical set up for either large or small quantity production.

Reed Thread Rolling Machines are manufactured under rigid quality standards by the pioneer-leader in the development of all types of thread rolling equipment.

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HOLDEN, MASSACHUSETTS
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Don't buy taps with blinders on!

Crōmclad® TAPS*

will provide a bonus in increased production that will make any difference in price seem unimportant. It's false economy to buy taps on price. Buy taps on the basis of their performance. Let Crōmclad Taps help you cut your tapping costs. Send coupon for price list.

* Crōmclad Taps are given a hard chrome surface treatment of less than .000050", uniform in depth on the thread form and in the flutes.

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6 OPTICAL WHEEL FORMING ATTACHMENT — *Parker-Hartford Corp, Optical Division, 650 Franklin Ave, Hartford, Conn.* 6-page brochure contains illustrated data on the British-made Optidress which mounts permanently to practically any standard surface or tool and cutter grinding machine, uses a 10 X microscope to assure a perfect blend between radii and angles in forming the wheel. It eliminates need for templets and does not require new setup between grinding and redressing. A radius and two tangent angles may be dressed in a continuous motion in a few minutes; more intricate forms are dressed by means of micrometer cross-slides.

TOOLS AND ACCESSORIES

7 TAP SELECTOR SYSTEM—*Besly-Welles Corp, South Beloit, Ill.* A master chart is the basis of the new system. To use it, customer needs only to know the material to be tapped and four colors. User reads directly across the chart from the line on which the material is found, looks for a symbol that indicates the best tap for the job; when he finds the symbol, he knows the tap to specify. Reference to detailed pages in the Tap Selector Booklet reveals the exact tap to order by size, pitch, pitch diameter limits, and order number. The booklet includes, in addition to specific tap size application data, basic information as to tap functions, sizes, styles, standards, and drill size selector charts. Additional chart describes cutting characteristics of various metals, tap recommendations, and lubrication suggestions.

8 TIME CONTROLS MANUAL—*Haydon Division of General Time Corp, Torrington, Conn.* 70-page basic manual starts with an elementary explanation of time controls and circuitry and progresses to complex application diagrams. Among specific subjects covered are basic construction of time controls; simplified explanation of switches and circuits; function and operation of elapsed time indicators; cycle timers; interval timers; time delay timers; and new line of Acrotimer reset timers.

9 TENTH PLUG GAGING SETS — *Deltronic Corp, 929 Baker St, Costa Mesa, Calif.* 4-page catalog covers sets in half-thousandths and thousandth steps. They are designed for use in measuring bored holes in tenths and also as setting standards for comparator use, snap gages, and micrometer settings. New X tolerance guaranteed by company makes it possible to use these gages as cylindrical masters, for setting purposes, where cylinders are to be measured. Section of the catalog is devoted to diagrams and explanation of unusual shortcuts to solve tenth gaging problems.

10 CARBIDE PRODUCTS — *Vascoloy-Ramet Corp, Waukegan, Ill.* 48-page price list No. 5 for use with catalog VR-58 lists V-R's complete line of carbide blanks and tools, carbide and ceramic inserts, Tantung cast-alloy tools, toolholders, and face mill cutters. Detailed charts give product dimensions, part numbers, grades stocked, standard package quantities, base prices, and maximum catalog quantities.

11 HOLE PUNCHING UNITS—*Wales Strippit Inc, 900 S Buell Rd, Akron, NY.* 12-page catalog BN covers new BN type of self-contained tooling line. In addition to aiding the reader in choosing the correct units for particular applications, it also offers recommendations on mounting methods and short cuts using Strippit tooling.

12 ELECTRIC ASSEMBLY TOOLS—*Black & Webster Inc, 570 Pleasant St, Watertown 72, Mass.* 16-page catalog 75-A provides illustrated information on equipment, much of which is automatic or semi-automatic, and how it may be used for staking, swaging, riveting, punching, marking, and terminal setting. Operation and application data included.

13 TOOLS—*L S Starrett Co, Athol, Mass.* 480-page third edition catalog 27 covers more than 3500 items including sections on mechanics' hand measuring tools and precision instruments; dial indicators; dial gages and instruments; special tools; hacksaws, hole saws, band saws; band knives; and precision ground flat stock. 20 pages of reference tables also included.

HEAT TREATING AND WELDING

14 STEEL WELDING MANUAL — *McKay Co, 1005 Liberty Ave, Pittsburgh 22, Pa.* 22-page catalog contains detailed information on specifications, operating characteristics, mechanical properties, applications, and other pertinent data on the company's mild steel and low hydrogen electrodes available for fabrication of mild and low alloy steels. Charts list recommended electrodes for the welding of trade name steels and ASTM carbon and low alloy steels. Included is a page on welding terminology plus a section on cause and prevention of common troubles.

15 OVENS AND FURNACES—*Blue M Electric Co, 138th & Chatham St, Blue Island Ill.* 64-page illustrated miniature catalog 600 covers complete line of electric ovens, furnaces, Magni-Whirl baths, environmental cabinets and related temperature controlled equipment. Photos and condensed descriptions are included for standard equipment giving sizes, temperature ranges, voltages, and capacities. Sizes are from less than 1 cu ft to 96 cu ft and temperature range covered is from 32 to 2800 F.

PLANT SERVICE EQUIPMENT

16 AUTOMATIC ROLLER AND IDLER REBUILDER — *Automatic Welding Co, 1005 Liberty Ave, Pittsburgh 22, Pa.* 5-page bulletin M1-402 presents data on a completely automatic machine designed for hard-metal resurfacing of tractor, crane, or shovel rollers, idlers and wheels. The Dual Head Micro-Matic will accept rollers, idlers, and wheels up to 40 in. in diameter. Includes photos and descriptions of construction and operational features of the machine plus a reference chart of hard surfacing wires, their grade, weld analysis, and typical applications.

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Investigate and you'll probably find that instead of having to go to the added time and expense of ordering special gears, that your needs can be filled from the American line.

American is a 'complete' stock gear line. Manufactured by Perfection — a veteran of over 30 years in the gear business — these gears are made to the most precise standards, from the highest quality materials. This popular line includes brass, bronze, steel, semi-steel, cast iron, and non-metallic gears in a range of 48 to 3 diametral pitch.

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Ask for FREE copy of American Stock Gear Catalog No. 360 containing detailed information and engineering data.

AMERICAN STOCK GEAR division

Perfection Gear Co., Harvey, Illinois

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

17 MATERIAL HANDLING EQUIPMENT—*Alfab Co, Albion, Mich.* 8-page brochure pictures and describes versatile line of equipment designed and built to customer specifications for all regular and/or highly specialized materials handling, processing, storage, and shipment. Some of these include dump hopper trailer trucks; core and mold trucks; special scrap trucks; barrel trucks; lift truck dump hoppers; automotive tire trucks; aluminum shelf trucks; and super-duty stock trailers.

18 INDUSTRIAL MAINTENANCE MATERIALS — *Ranco Industrial Products Corp, 12311 Union Ave, Cleveland 20, Ohio.* 22-page illustrated 1961-62 catalog covers industrial floor and roof repair, machinery anchoring and grouting, and electric motor cleaning. Prices, coverages, drying time, and general application procedures are included. Among 75 products described are an instant floor patch that is applied by rolling with an ordinary lift truck, and a spray process for resurfacing roofs.

19 HYDRAULICS INSTALLATIONS—*Oil-Dyne Inc, 2115-A West Marquette Rd, Chicago 36, Ill.* 76-page catalog 21 deals with every requirement for a complete hydraulics installation, from pumps to accessories. Described and illustrated are 96 basic models of the miniaturized Oil-Dyne hydraulic pump. Other company products described are hand pumps, standard and heavy-duty pressure switches, relief valves, gages, and a full line of cylinders from ½ to 4-in. bore sizes. Separate section is devoted to accessories recommended for use with O-D equipment.

PARTS AND MATERIALS

20 PRE-ALLOYED POWDERS — *Hoeganaes Sponge Iron Corp, Riverton, NJ.* 4-page brochure, Form 128, provides basic data, lists advantages and availability of these products, details important properties.

21 SEMI-STEEL VALVES — *Rockwell Manufacturing Co, Nordstrom Valve Division, 330 N Lexington Ave, Pittsburgh 8, Pa.* 44-page V-203 gives specifications and dimensions for all sizes of semi-steel straightway, steam jacketed, multiport, and special order R-N valves. Accessories described include wrenches, locking devices, extensions, lubricants, and the new Rockwell Hypregun for lubricating valves. ●

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The new SWECO Vibro-Energy* Finishing Mill does in 35 to 165 minutes what ordinary vibratory equipment *takes 5 hours to do.* Results of 8 impartial comparison tests (weight loss in grams and RMS improvement, on cast iron, hard steel, stainless and aluminum) prove SWECO produces the same finish *in 45% to 88% less time.* Charts of all 8 tests are included in a new, illustrated technical treatise that will be mailed on your request. It describes in detail the superior performance of high-frequency, three-dimensional vibration in finishing metal, ceramic and plastic parts. For a copy, write SOUTHWESTERN ENGINEERING COMPANY, 4800 Santa Fe, Los Angeles 58, Dept. 73381

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DeVilbiss automatic parts washers clean faster and more thoroughly because they're engineered specifically for the job—for continuous conveyor operation or batch-type work. Units available in both standardized and custom designs to meet your exact operating problems. Send for Catalog 1101, or contact your local DeVilbiss representative for a specific recommendation and prompt quotation. The DeVilbiss Company, Toledo 1, Ohio. Offices in principal cities.

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NAMES IN THE NEWS

Robert E Morris Co, West Hartford, Conn, distributor of metalworking machinery and tools, has named **William M Taul Jr** general sales manager. He was formerly a staff assistant to the president

Link-Belt Co, Chicago, has appointed **Richard S Moyer** director of manufacturing. He succeeds **Harold L Hoefman** who retired as vice president, manufacturing, April 28. Mr Moyer was formerly assistant to the vice president in Indianapolis with headquarters at the Ewart plant. **Roy E Lambert** has been named general manager of the Bearing Plant to replace **Raymond S Wood** who has retired after 47 years of service. Mr Lambert was previously assistant general manager of the Dodge Plant in Indianapolis.

John W Bolton & Sons Inc has elected **A L Bolton Jr** president of the company and of the **Emerson Manufacturing Co Division,** Lawrence, Mass, manufacturer of machine knives. Formerly general manager, he succeeds **John G Bolton,** named board chairman.

Electric Autolite Co, Toledo, has named **R A Olsen** general manager of the Wire and Cable Division. He has been serving as an account executive in the Detroit sales office.

Olsen Manufacturing Co, Royal Oak, Mich, has named **William F Peschel** manager of the Induction Heating Equipment Division and **William M Peterson** chief engineer. Mr Peschel was formerly district manager of Ajax Magnethermic Corp and Mr Peterson was associated with Cargill-Detroit Corp as production manager and plant superintendent.

Trent Tube Co, East Troy, Wis, has promoted **L R Miller** from works manager to vice president, manufacturing.

Detroit Broach & Machine Co, Rochester, Mich, has appointed **S R Cudnohufsky** manager of a newly created tracer control sales division which will market a machine tool conversion unit. **R L Kamishke** has been named manager of the new broach sales division which will now handle sales of the company's broaching machines and allied tooling only.

International Resistance Co, Philadelphia, has named **J Penn Rutherford** executive vice president. He was formerly general manager of Raytheon Co's Commercial Apparatus and Systems Division.

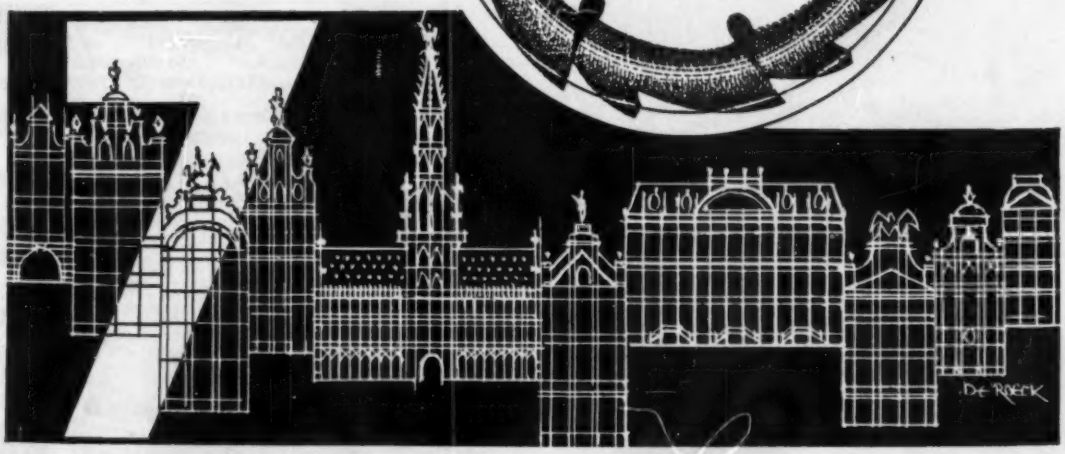
Ryan Aeronautical Co, San Diego, Calif, has appointed **G W Rutherford** vice president, operations. He was previously vice president and division manager of Ryan Electronics. **H L Fontaine** has been named vice president, manufacturing, reporting to Mr Rutherford. Mr Fontaine has been vice president, operations, of the electronics manufacturing plant at Torrance.

BSA Tools Ltd, Birmingham, England, machine tool maker, has appointed **W A B McCoy** manager for BSA Tools Division operations in the United States. Mr McCoy has been located at **National Acme Co,** Cleveland, for the past seven years as factory representative. National will continue as importing agents for sales and service of the BSA line of single spindle automatic screw machines. Mr McCoy will make his headquarters in the Newark, NJ, area.

Dayton Malleable Iron Co has elected **John F Torley** president to succeed **Anthony Haswell,** named board chairman. Mr Torley has been a vice president of National Malleable & Steel Casting Co of Cleveland. •

Willys Motors Inc, Toledo, has named **Cruse W Moss** executive vice president. He was previously vice president, sales

3-12 SEPT BRUXELLES 1961



Exhibiting machine tools and related equipment produced in the ten member countries of the European Committee for Cooperation of the Machine Tool Industries: Austria, Belgium, Denmark, France, Germany, Italy, Great Britain, Netherlands, Sweden, and Switzerland.

Brussels itself is an interesting tourist center and is within easy reach of Antwerp, Bruges, Paris, etc.

Hotel reservations may be made through any Thomas Cook or Wagons-Lits office.

A catalog containing all pertinent information, including a list of all exhibitors, classified by product, will be published in July, 1961, and can be ordered now. Price $3.00, registered airmail.

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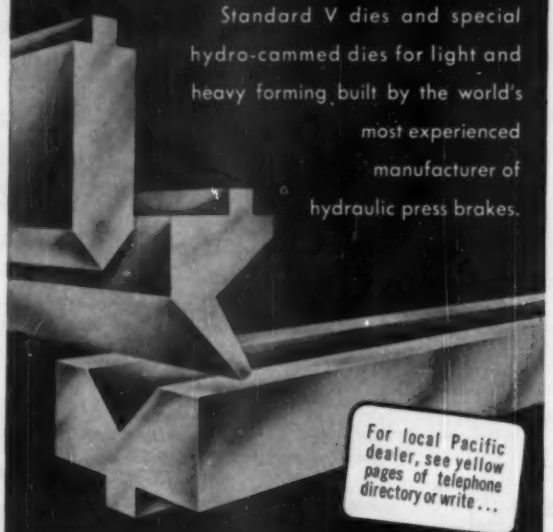
PRESS BRAKE DIES

Standard V dies and special hydro-cammed dies for light and heavy forming built by the world's most experienced manufacturer of hydraulic press brakes.



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MANY STANDARD SHAPES & SIZES TO CHOOSE FROM
SPECIAL SHAPES & SIZES AVAILABLE ON SHORT NOTICE
SEVERANCE MIDGET MILL SET NO. 77 IS A POPULAR SET OF 1/2" DIAMETER, 1/4" SHANK, HIGH SPEED MIDGET MILLS. MAKES A FINE GET-ACQUAINTED-SET AND WILL COVER A BIG MAJORITY OF YOUR NEEDS FOR THIS TYPE TOOL. LEAFLET NO. 651 GIVES DETAILED INFORMATION AND PRICES. ASK FOR IT TODAY!
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milling boring and combined machine

Universality, productivity and easy handling....

are characteristics of INNOCENTI-CWB milling, boring and combined machine.

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3. Automatics
7. Boring Mills
8. Broaching Machines
13. Cranes, Overhead Traveling
17. Drilling & Reaming Machines
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25. Gear Cutting Machines
26. Grinding Machines
30. Keyseaters
31. Lathes
33. Machine Tools
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45. Press Brakes
46. Presses
48. Rebuilding, Cranes, Electric Hoists
51. Roll Formers
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56. Shapers
57. Shears
66. Welding Equipment
69. Plants
70. Electric Hoists

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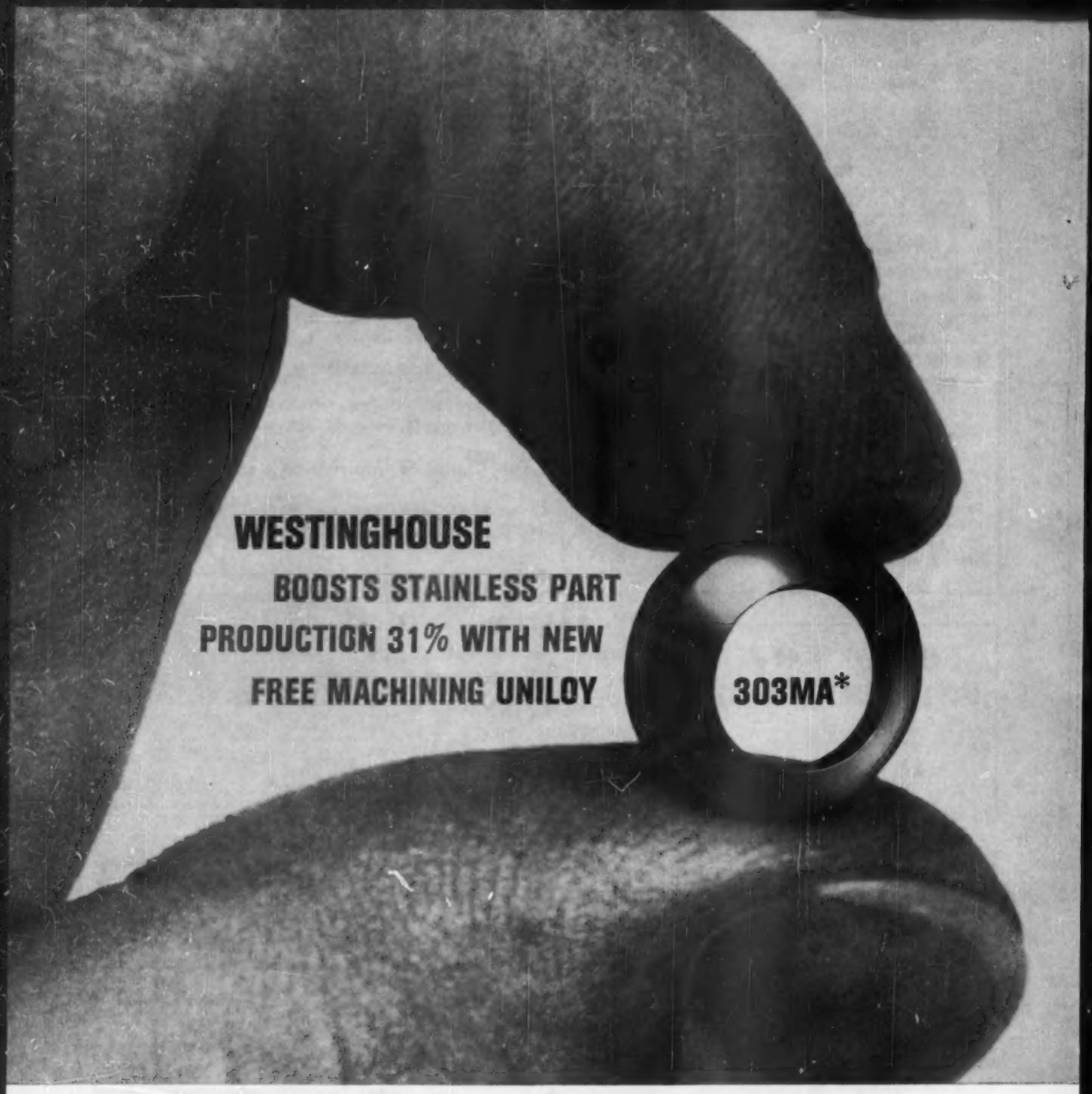

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3-58

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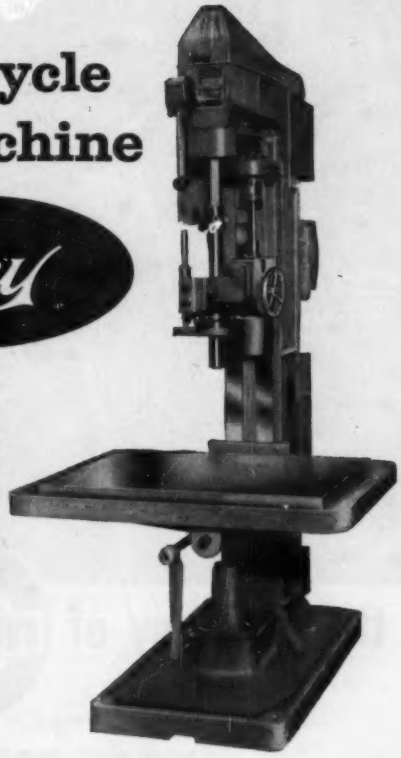
automatic cycle drilling machine

Avey



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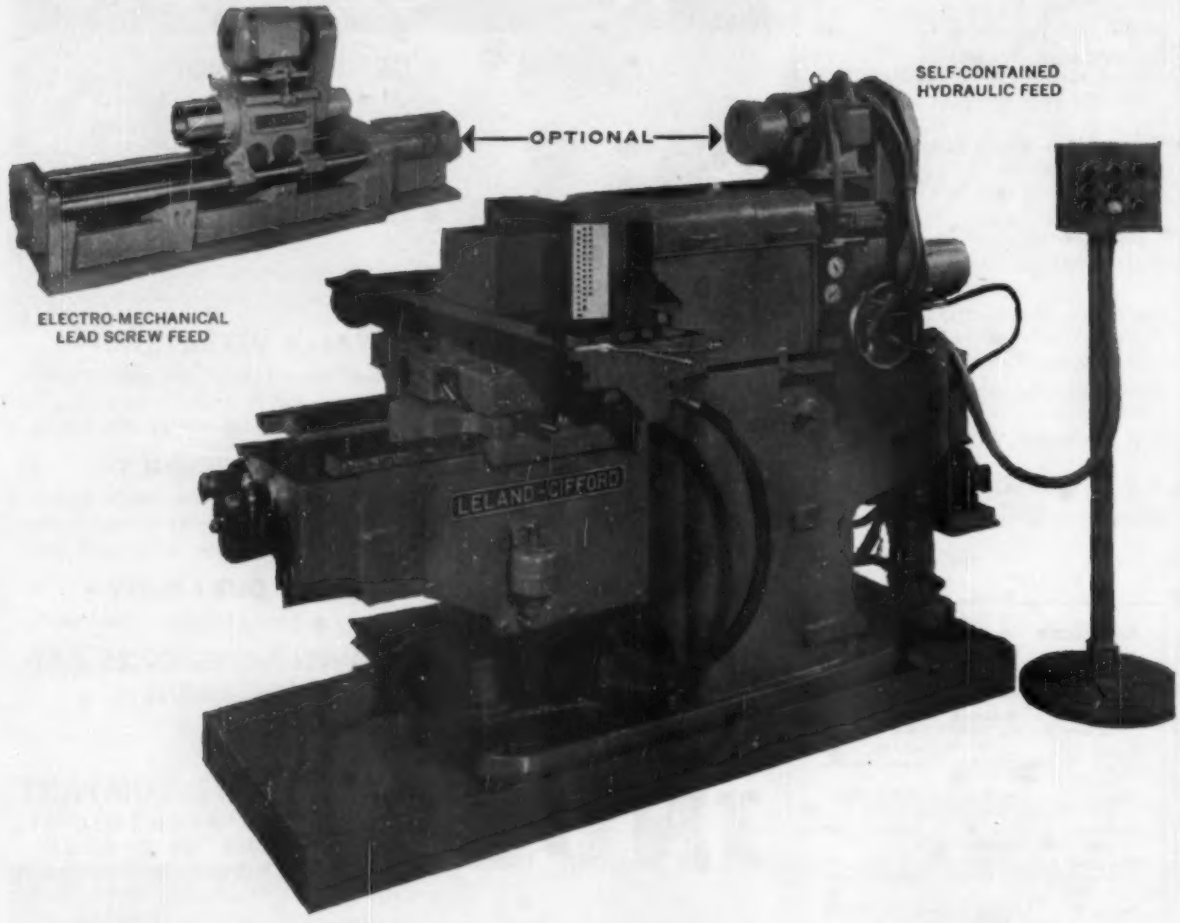

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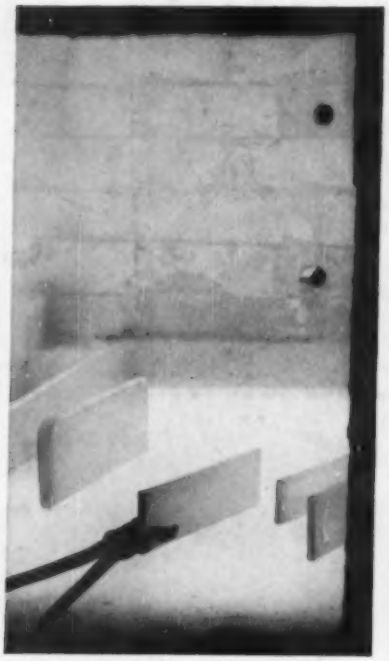

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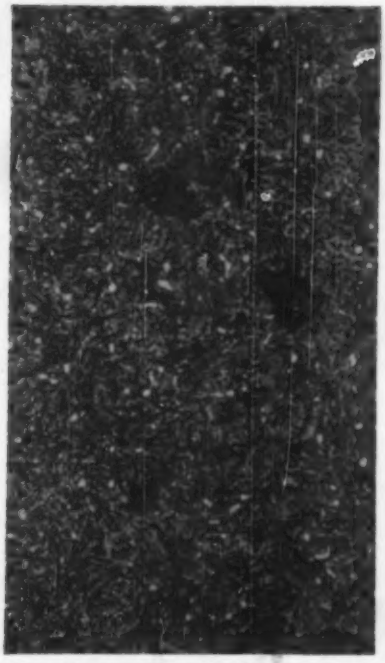

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